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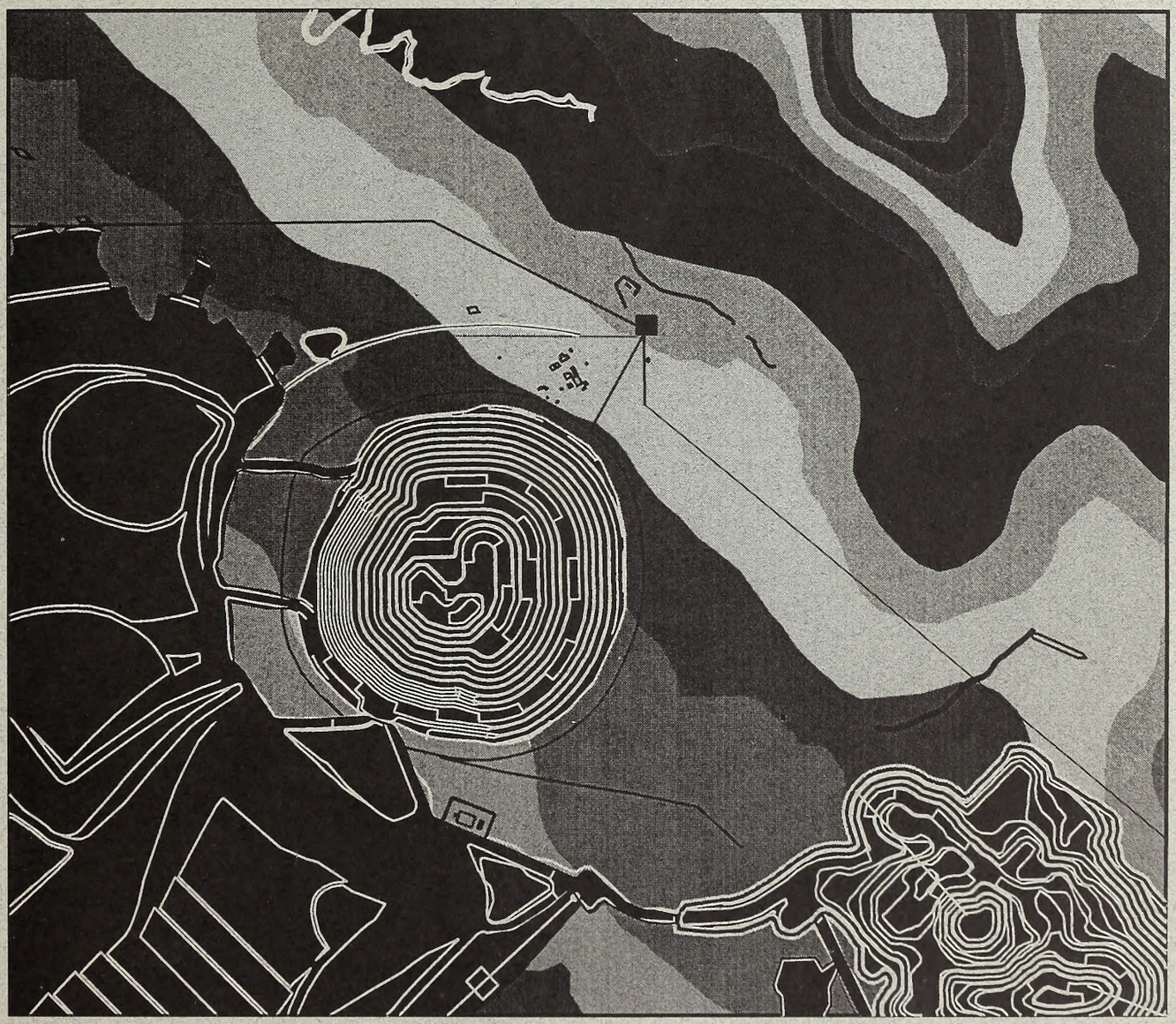
September 1998

Draft
Environmental Impact Statement
Dos Pobres/San Juan Project
Volume 2: Figures and Appendices



Cooperating Agencies:

U.S. Army Corps of Engineers
U.S. Environmental Protection Agency
U.S.D.I. Bureau of Indian Affairs

The Bureau of Land Management is responsible for the balanced management of the public lands and resources and their various values so that they are considered in a combination that will best serve the needs of the American people. Management is based upon the principles of multiple use and sustained yield; a combination of uses that take into account the long term needs of future generations for renewable and nonrenewable resources. These resources include recreation, range, timber, minerals, watershed, fish and wildlife, wilderness and natural, scenic, scientific, and cultural values.

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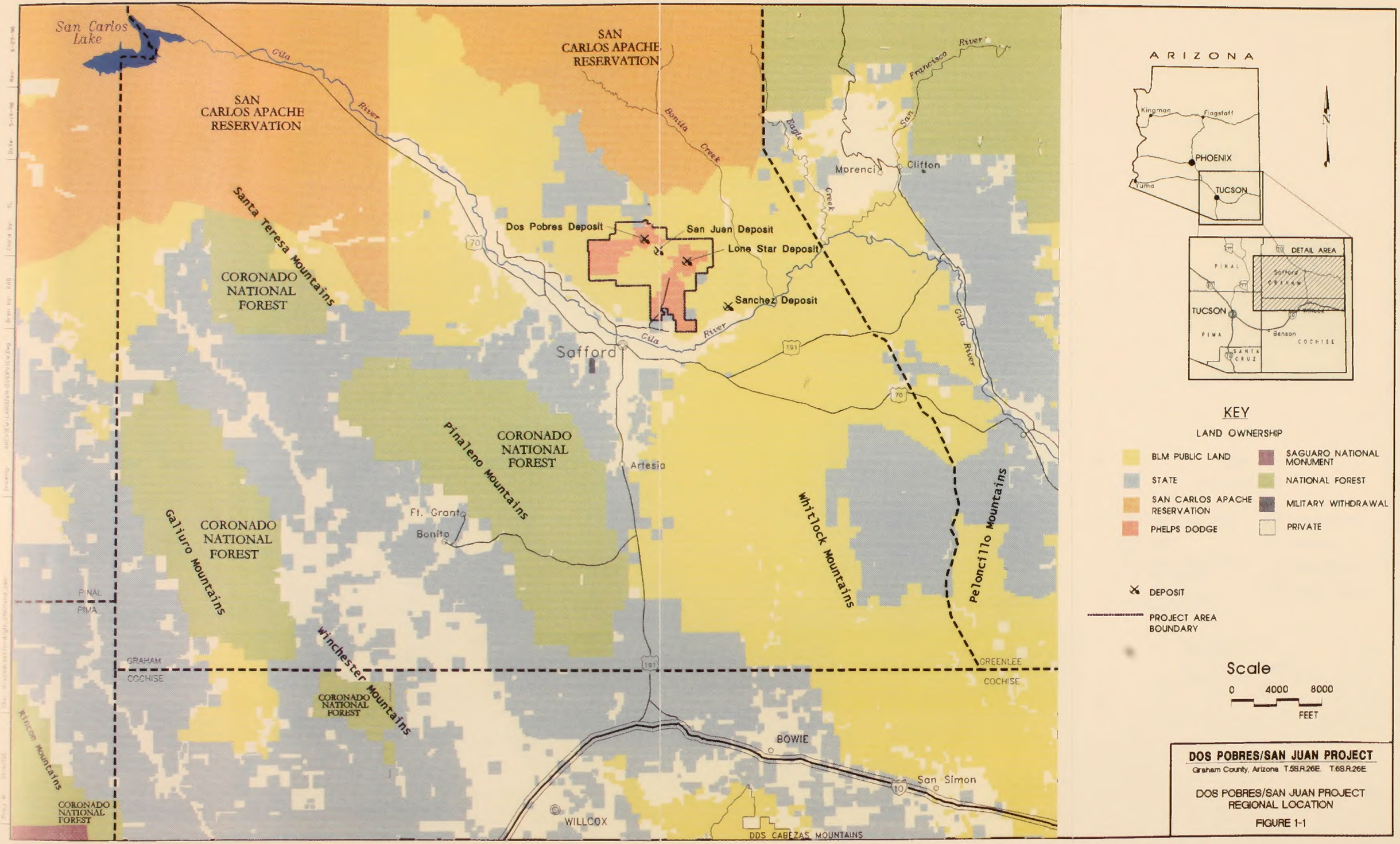
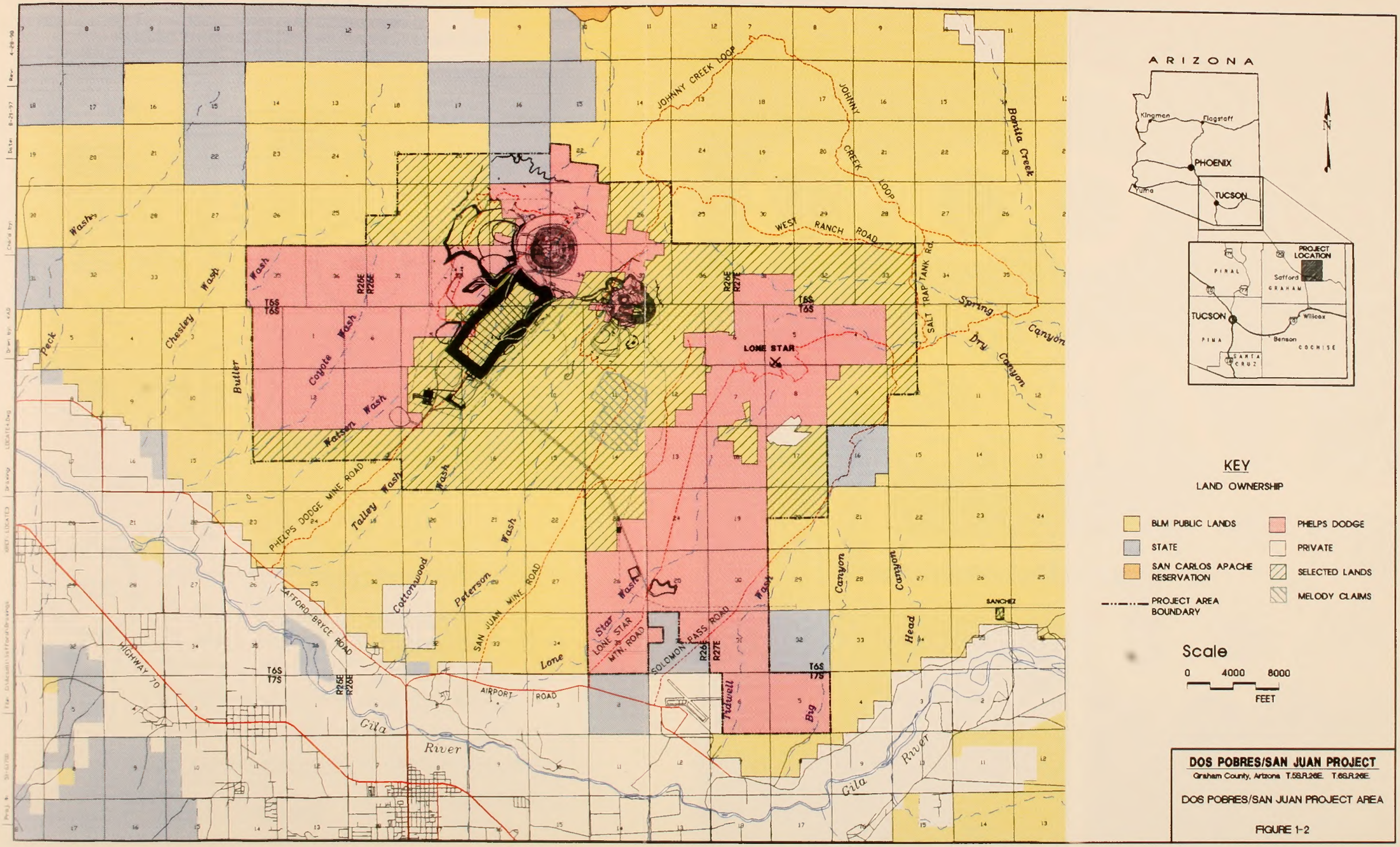


DOS POBRES/SAN JUAN PROJECT

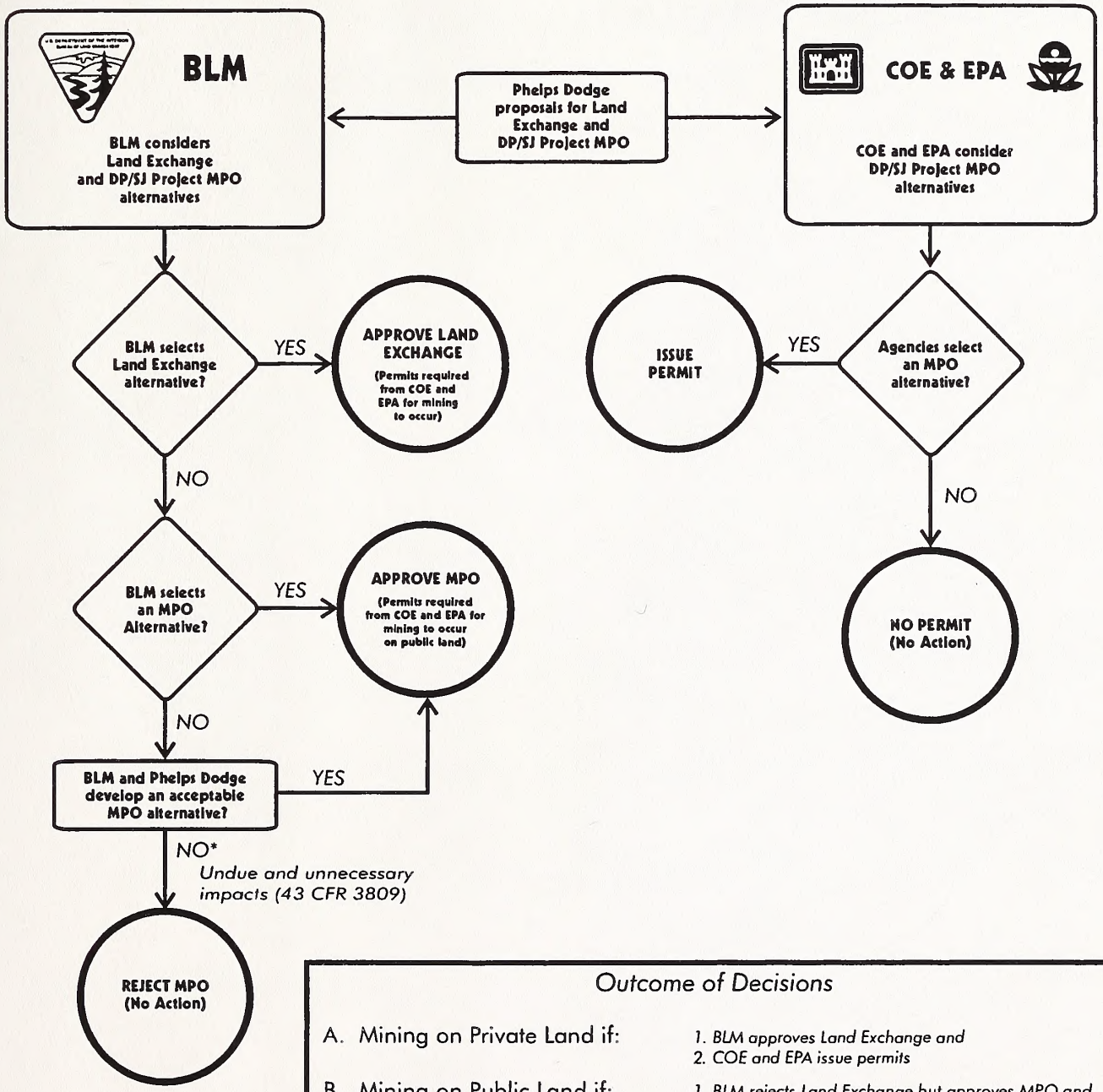
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

DOS POBRES/SAN JUAN PROJECT
REGIONAL LOCATION

FIGURE 1-1


ARIZONA
Kingman
Flagstaff
PHOENIX
Yuma
TUCSON
PROJECT LOCATION
PINAL
Safford
GRAHAM
TUCSON
Willcox
Benson
PIMA
COCHISE
SANTA CRUZ
KEY
LAND OWNERSHIP
BLM PUBLIC LANDS
STATE
SAN CARLOS APACHE RESERVATION
PROJECT AREA BOUNDARY
PHELPS DODGE
PRIVATE
SELECTED LANDS
MELODY CLAIMS
Scale
0 4000 8000
FEET
JOHNNY CREEK LOOP
WEST RANCH ROAD
SALT TRAP TANK Rd.
Bonita Creek
Spring Canyon
Dry Canyon
LONE STAR
Peck Wash
Chesley Wash
Butler Wash
Coyote Wash
Watson Wash
Talley Wash
PHELPS DODGE MINE ROAD
Cottonwood Wash
Peterson Wash
SAN JUAN MINE ROAD
SAFFORD-BRYCE ROAD
HIGHWAY 70
Lone Star Wash
LONE STAR MTN. ROAD
SOLOMON PASS ROAD
Tidwell Wash
Big Canyon
Canyon Head
SANCHEZ
AIRPORT ROAD
Gila River
T6S T7S
R26E R27E
DOS POBRES/SAN JUAN PROJECT
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.
DOS POBRES/SAN JUAN PROJECT AREA
FIGURE 1-2

Decision Processes of Federal Permitting Agencies



Outcome of Decisions

A. Mining on Private Land if:	1. BLM approves Land Exchange and 2. COE and EPA issue permits
B. Mining on Public Land if:	1. BLM rejects Land Exchange but approves MPO and 2. COE and EPA issue permits
C. No Mining on Private Lands if:	1. BLM approves Land Exchange but 2. COE and EPA do not issue permits
D. No Mining on Public Lands if:	1. BLM rejects Land Exchange and MPO and 2. COE and EPA do not issue permits

The above is strictly a Federal decision process. State permitting is required for mining operations regardless of land ownership.

*BLM may only reject an MPO due to undue and unnesessary impacts and must indicate the changes necessary to approve the MPO.

SWCA Inc. Environmental Consultants

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

DECISION PROCESSES OF FEDERAL PERMITTING AGENCIES

FIGURE 1-3

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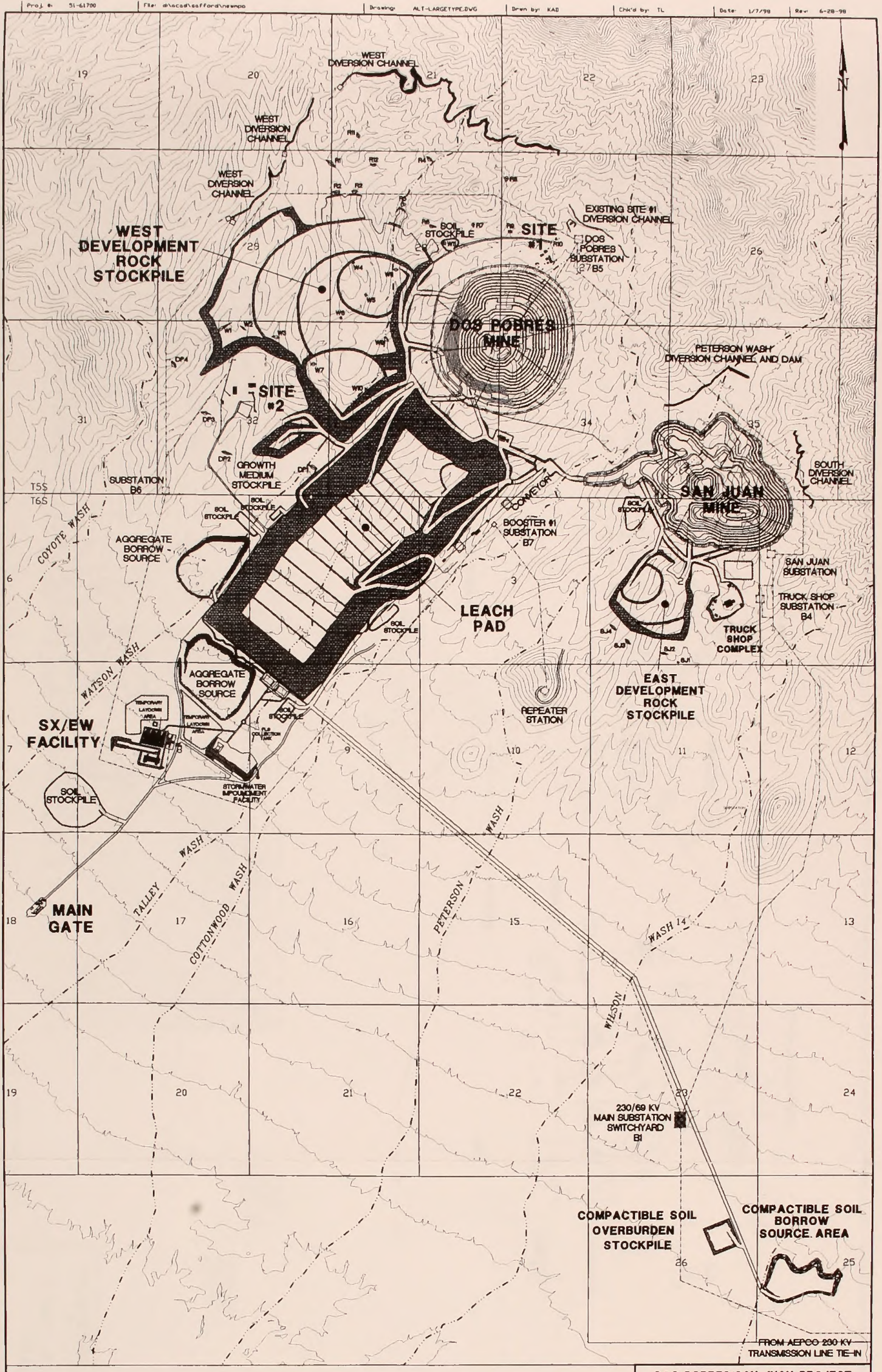
Figures for Chapter 2

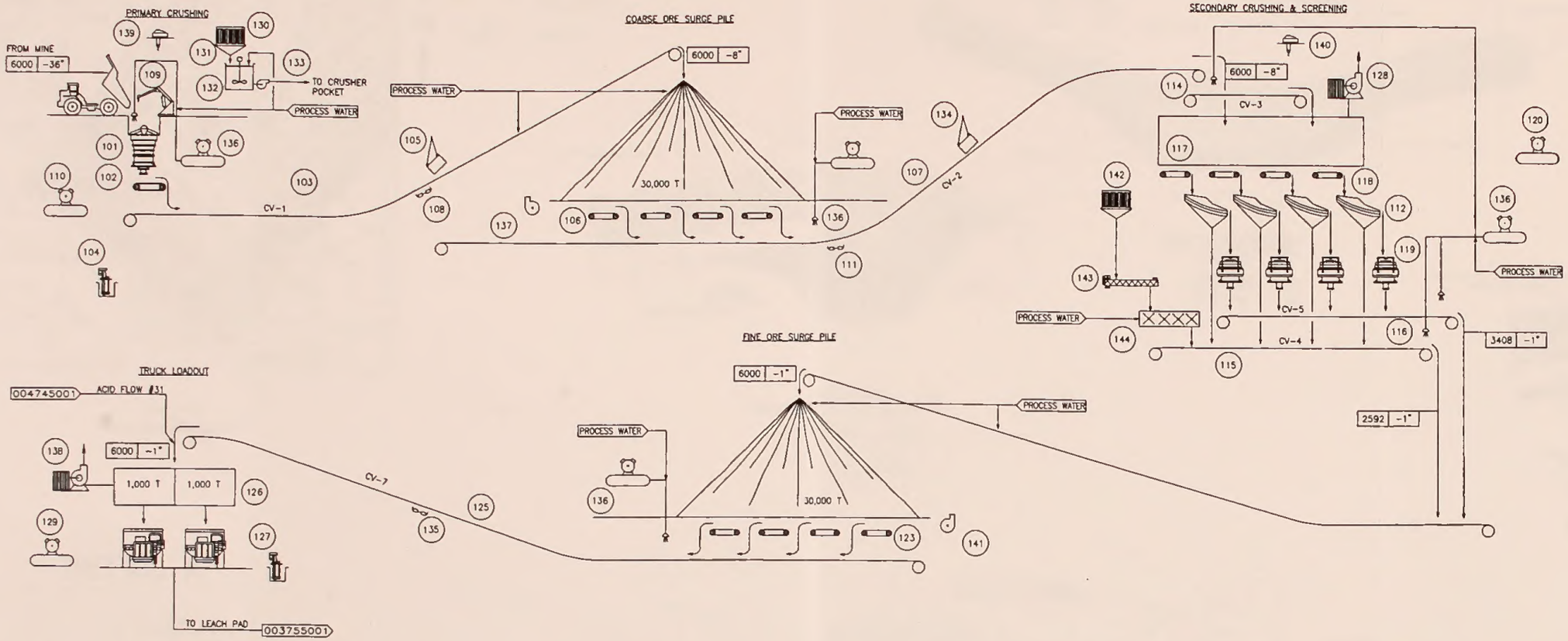


DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

DETAILED SITE PLAN OF DOS POBRES/ SAN JUAN PROJECT

FIGURE 2-1



EQUIPMENT LIST

ITEM	NO. REQ'D.	EQUIPMENT NO.	EQPT. REF.	DESCRIPTION	HP/UNIT	ITEM	NO. REQ'D.	EQUIPMENT NO.	EQPT. REF.	DESCRIPTION	HP/UNIT
101	1	20-2710-5111-001	CR-1	GYRATORY CRUSHER - 60x109/110		123	4	20-2750-5332-001 THRU 004	F-4	FINE ORE STORAGE DISCHARGE BELT FEEDER - 72" x 30'-0	100
102	1	20-2710-5332-001	F-1	BELT FEEDER - 96" x 30'-0	250	124					
103	1	20-2710-5310-001	CV-1	PRIMARY CRUSHING DISCHARGE CONVEYOR - 60" x	1250	125	1	20-2750-5310-001	CV-7	FINE ORE STORAGE DISCHARGE CONVEYOR - 60"	1500
104	2	20-2710-5440-001 THRU 002	P-1	PRIMARY CRUSHING SUMP PUMP - 3"ø	25	126	2	20-2790-5950-001 THRU 002	B-2	TRUCK LOAD OUT BIN CHUTE	-
105	1	20-2710-5380-001	M-1	BELT MAGNET	20	127	1	20-2790-5440-001	P-2	TRUCK LOAD OUT SUMP PUMP 3"ø	25
106	4	20-2720-5332-001 THRU 004	F-2	COARSE ORE PILE BELT FEEDER - 72" x 30'-0	100	128	1	20-2740-5850-002	DC-5	SHAKER BAG HOUSE	7.5
107	1	20-2720-5310-001	CV-2	COARSE ORE DISCHARGE CONVEYOR - 60"	1250	129	1	20-2790-5940-001	AC-3	AIR COMPRESSOR - 200 CFM	50
108	1	20-2710-5380-002	S-1	WEIGH SCALE	-	130	1	20-2710-5850-001	DC-1	BAG HOUSE - 16,000 CFM	30
109	1	20-2710-5160-001	RB-1	ROCK BREAKER	100	131	1	20-2710-5521-001	MX-1	MIXING AGITATOR	10
110	1	20-2710-5940-001	AC-1	AIR COMPRESSOR - 200 CFM	50	132	1	20-2710-5270-001	MT-1	MIXING TANK	-
111	1	20-2720-5380-001	S-2	WEIGH SCALE	-	133	1	20-2710-5440-003	P-3	TRANSFER PUMP	25
112	3	20-2730-5514-001 THRU 003	SC-1	SCREEN	75	134	1	20-2720-5380-002	M-2	BELT MAGNET	20
113						135	1	20-2750-5380-001	S-3	WEIGH SCALE	-
114	1	20-2730-5310-001	CV-3	SCREEN BIN CONVEYOR - 72"	75	136	4	20-2710-5850-005 THRU 008	DC-3	ATOMIZED WATER SPRAY SYSTEM C/W COMPRESSOR	100
115	1	20-2730-5310-002	CV-4	SCREEN UNDERSIZE CONVEYOR - 72"	50	137	1	20-2720-5820-001	AH-2	VENTILATION FAN	10
116	1	20-2740-5310-001	CV-5	SECONDARY CRUSHER CONVEYOR - 72"	50	138	2	20-2790-5850-001 THRU 002	DC-2	SHAKER BAG HOUSE	7.5
117	1		B-1	SECONDARY CRUSHER SURGE BIN	-	139	1	20-2710-5910-001	H-1	110/20T O/H CRANE	200/25/10/4x5
118	3	20-2730-5332-001 THRU 003	F-3	SCREEN BELT FEEDER - 72" x 30'-0	30	140	1	20-2740-5910-001	H-2	45/5T O/H CRANE	100/10/4x2
119	3	20-2740-5112-001 THRU 003	CR-2	SECONDARY CRUSHER - MP1000	1000/10/10	141	1	20-2750-5820-001	AH-1	VENTILATION FAN	10
120	1	20-2740-5940-001	AC-2	AIR COMPRESSOR - 200 CFM	50	142	1	20-2740-5850-001	DC-4	BAG HOUSE - 60,000 CFM	60
121	1	20-2740-5310-002	CV-6	SECONDARY CRUSHING DISCHARGE CONVEYOR 60"	1250	143	1	20-2740-5360-001	SCV-1	SCREW CONVEYOR	20
122						144	2	20-2740-5522-001 THRU 002	PG-1	PUG MILL MIXER	50

LEGEND

	S.T.P.H. SOLIDS	P80 SIZE
DRY		

- 100,000 STPD
- 16.7 HRS/DAY
- 6,000 STPH
- Wi 12.5

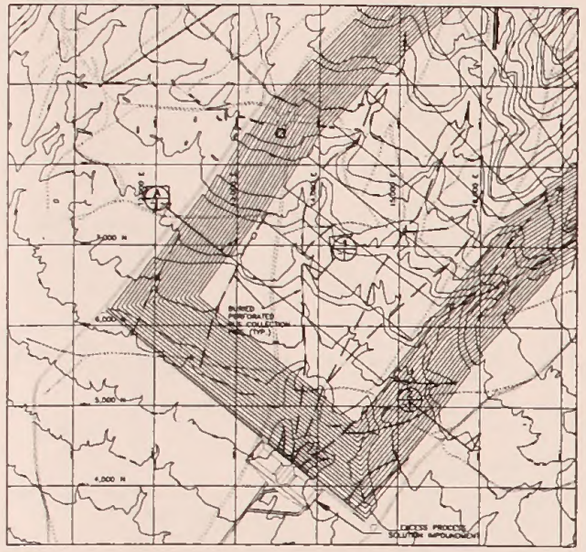
Source: Simons Mining Group

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona

CRUSHING PLANT FLOW DIAGRAM

FIGURE 2-2



APPROXIMATE
0 1000 2000
SCALE IN FEET

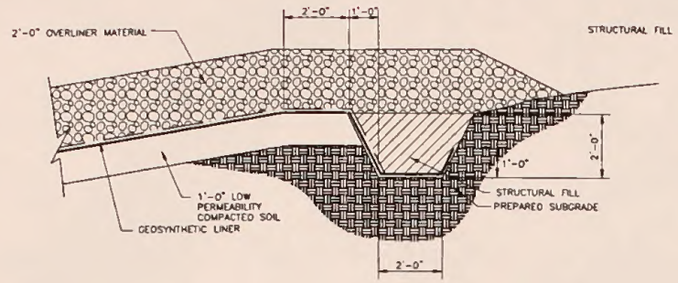
N

LEGEND:

ROADS

BURIED PERFORATED PLS COLLECTION PIPE

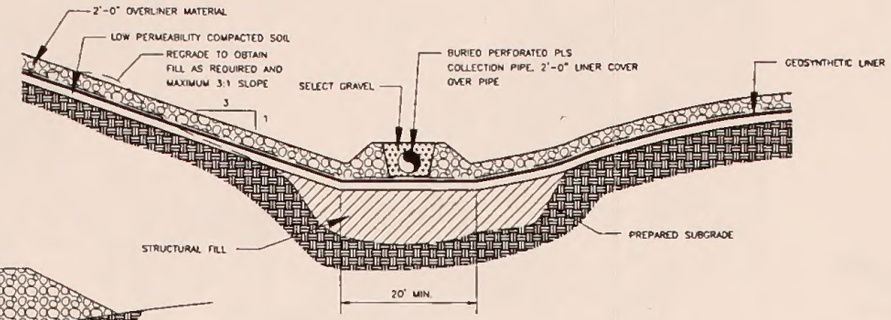
FILL AREAS



TYPICAL ANCHOR TRENCH ALONG NORTHERN EDGE OF LINED AREA

DETAIL 1

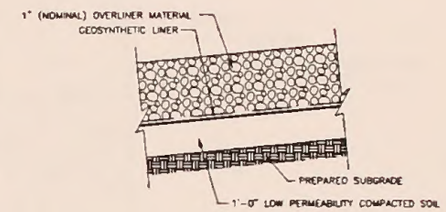
APPROXIMATE
0 2 4
SCALE IN FEET



TYPICAL CROSS SECTION FOR BURIED PERFORATED PLS PIPE

SECTION 8

NOT TO SCALE

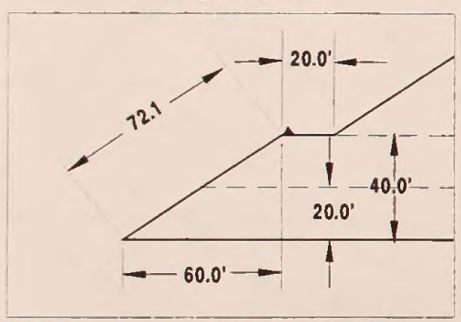


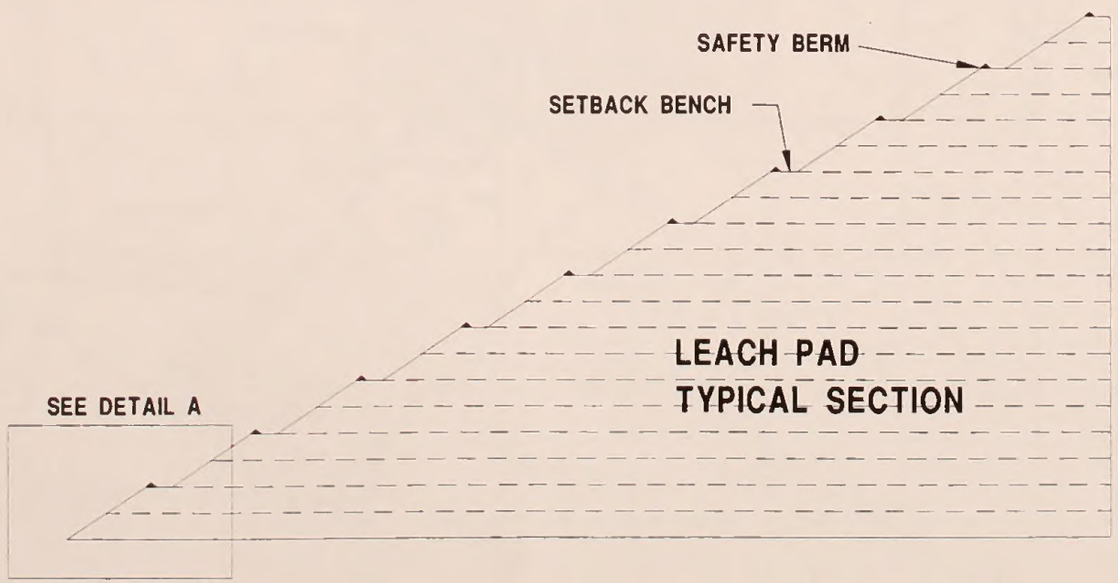
TYPICAL CROSS SECTION COMPOSITE LINER

DETAIL 2

APPROXIMATE
0 2 4
SCALE IN FEET

DETAIL A





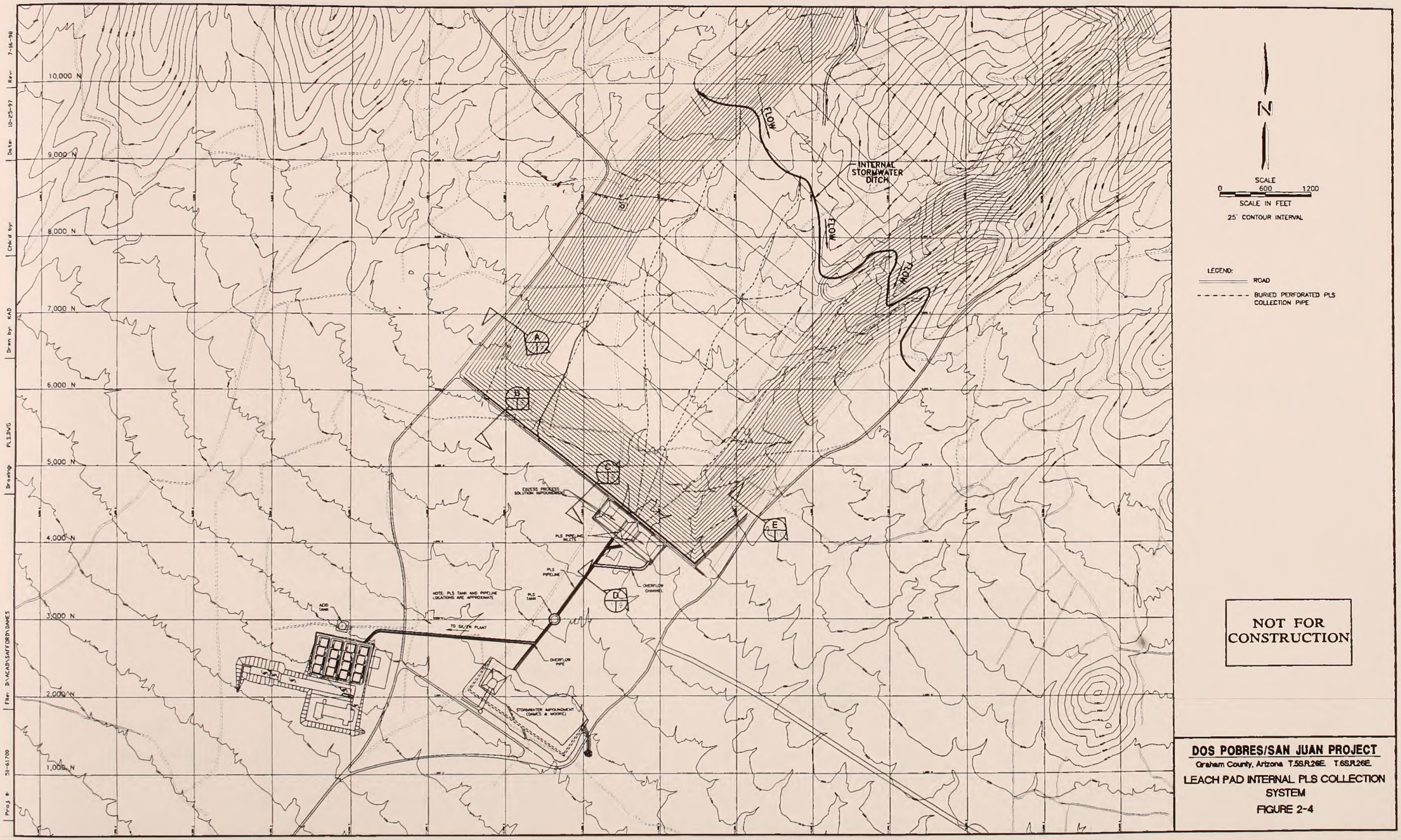
NOT FOR CONSTRUCTION

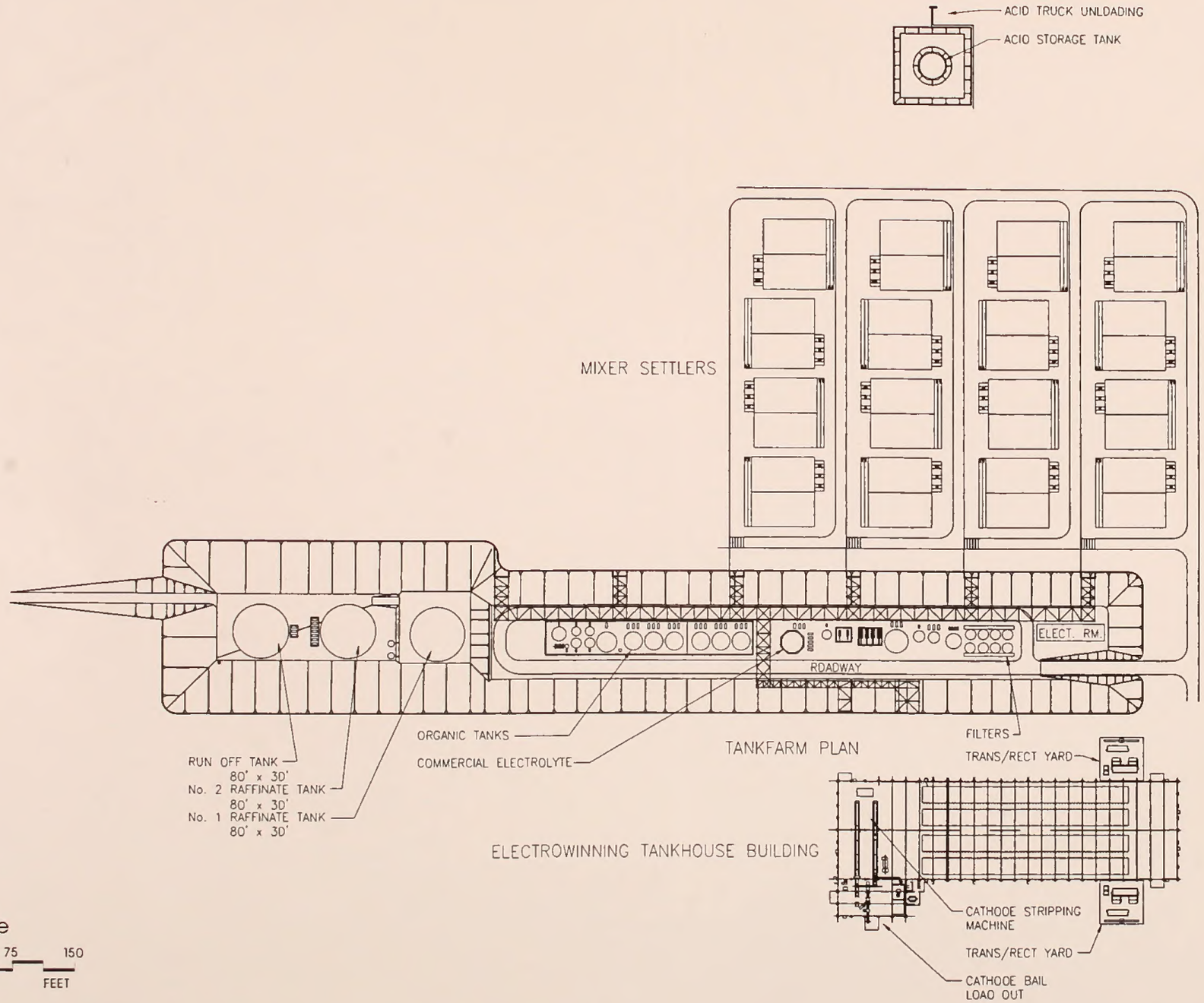
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

TYPICAL CROSS SECTION AND DESIGN DETAILS - LEACH PAD

FIGURE 2-3


10,000 N
9,000 N
8,000 N
7,000 N
6,000 N
5,000 N
4,000 N
3,000 N
2,000 N
1,000 N
FLOW
FLOW
FLOW
INTERNAL STORMWATER DITCH
A
B
C
D
E
EXCESS PROCESS SOLUTION IMPOUNDMENT
PLS PIPELINE INLETS
PLS PIPELINE
OVERFLOW CHANNEL
NOTE: PLS TANK AND PIPELINE LOCATIONS ARE APPROXIMATE
PLS TANK
ACID TANK
TO SX/EW PLANT
OVERFLOW PIPE
STORMWATER IMPOUNDMENT (GAMETS & MOORE)
N
SCALE
0 600 1200
SCALE IN FEET
25' CONTOUR INTERVAL
LEGEND:
ROAD
BURIED PERFORATED PLS COLLECTION PIPE
NOT FOR CONSTRUCTION
DOS POBRES/SAN JUAN PROJECT
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.
LEACH PAD INTERNAL PLS COLLECTION SYSTEM
FIGURE 2-4



Source: Simons Mining Group

DOS POBRES/SAN JUAN PROJECT
Graham County, Arizona

SX/EW PLANT SITE PLAN

FIGURE 2-5

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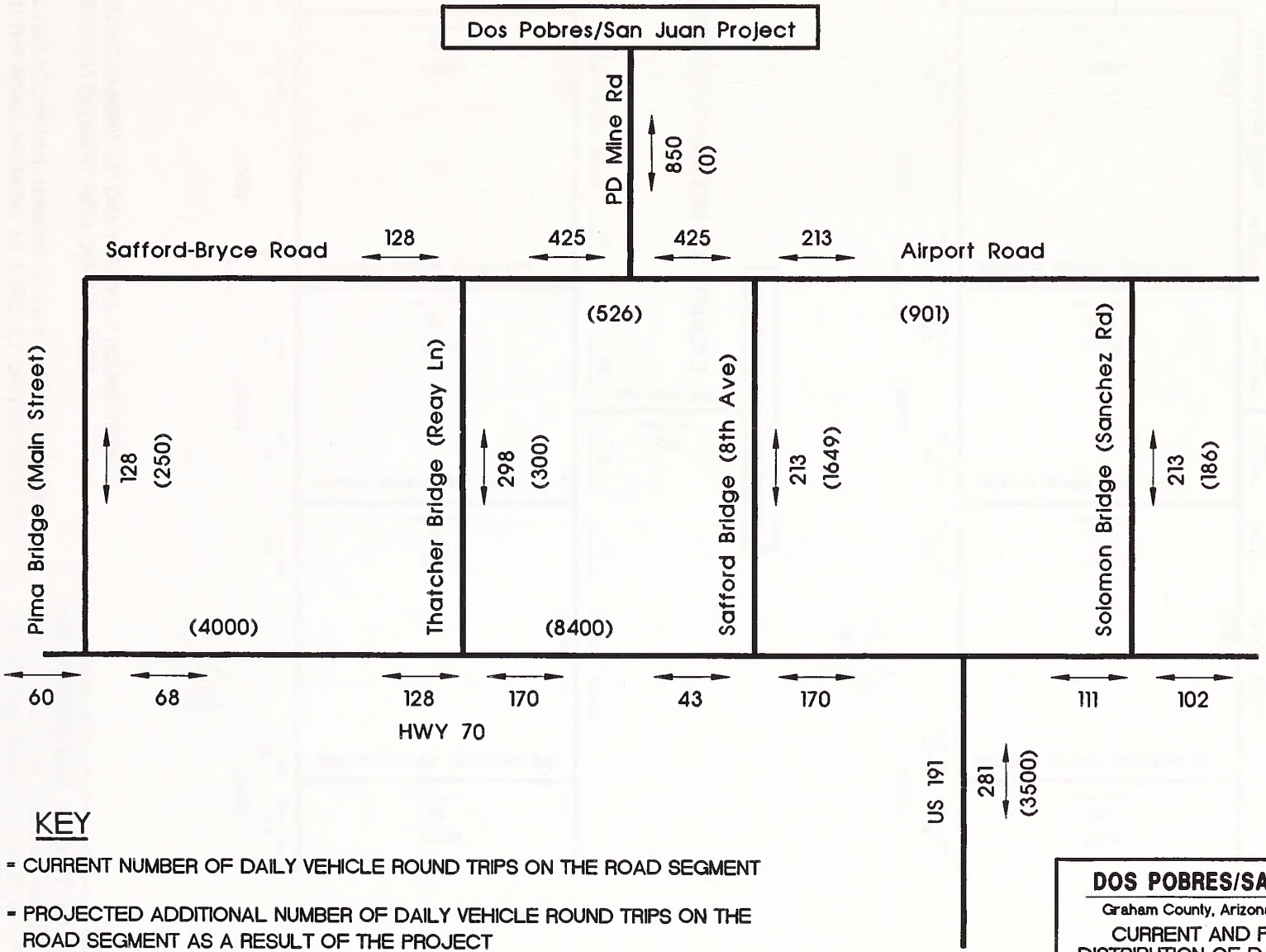
DURING CONSTRUCTION



KEY

(XXX) = CURRENT NUMBER OF DAILY VEHICLE ROUND TRIPS ON THE ROAD SEGMENT

XXX = PROJECTED ADDITIONAL NUMBER OF DAILY VEHICLE ROUND TRIPS ON THE ROAD SEGMENT AS A RESULT OF THE PROJECT

(Source: Curtis Lueck, 1997)

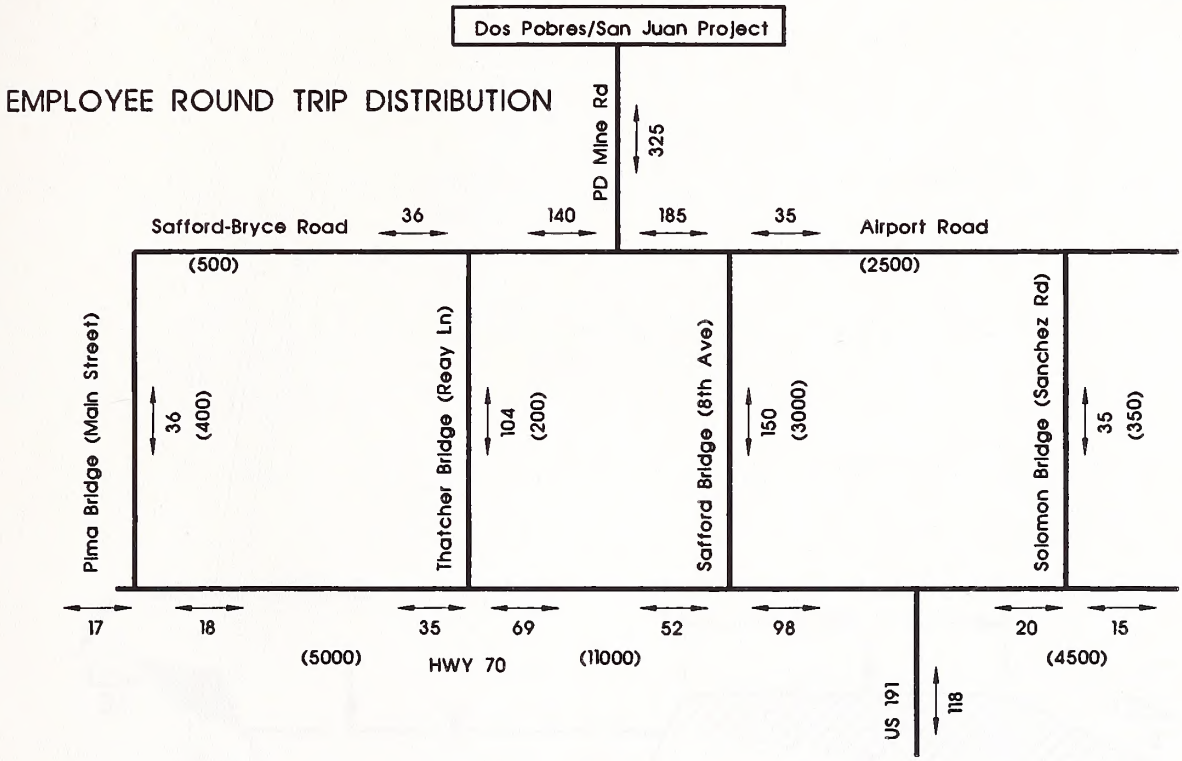
DOS POBRES/SAN JUAN PROJECT

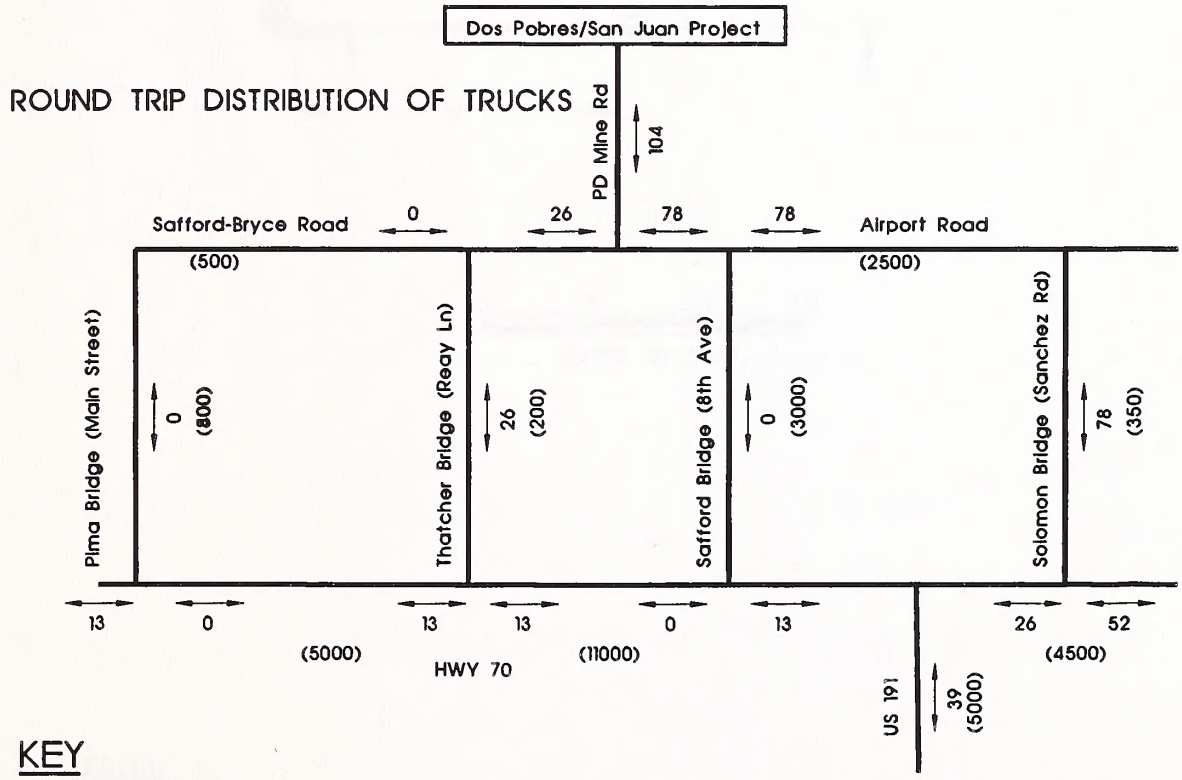
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

CURRENT AND PROJECTED PEAK DISTRIBUTION OF DAILY VEHICLE ROUND TRIPS DURING CONSTRUCTION

FIGURE 2-6

DURING OPERATIONS





KEY

(XXX) = PROJECTED NUMBER OF DAILY VEHICLE ROUND TRIPS ON THE ROAD SEGMENT WITH OUT PROJECT

XXX = PROJECTED ADDITIONAL NUMBER OF DAILY VEHICLE ROUND TRIPS ON THE ROAD SEGMENT AS A RESULT OF THE PROJECT *

* Does not account for carpooling and a five day work week.

(Source: Curtis Lueck, 1997)

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

PROJECTED PEAK DISTRIBUTION OF DAILY VEHICLE TRIPS DURING OPERATIONS FOR TRUCKS AND EMPLOYEE TRAFFIC COMPARED TO YEAR 2011 PROJECTIONS

FIGURE 2-7

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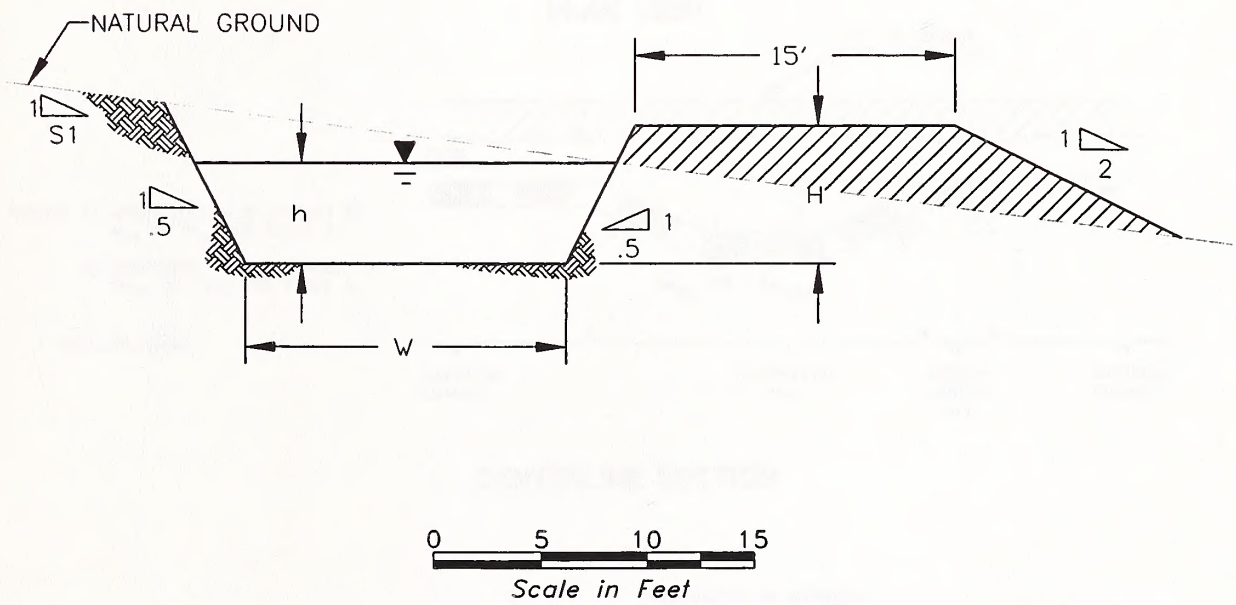


LEGEND

GROUND

FILL MATERIAL

PRELIMINARY
NOT FOR CONSTRUCTION
OR RECORDING

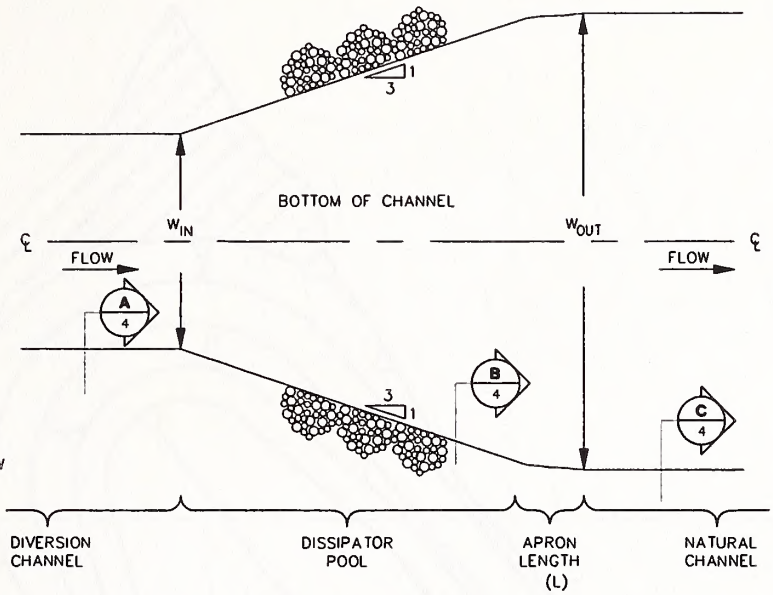
Source: Dames & Moore 1998C

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

TYPICAL DIVERSION CHANNEL
CROSS-SECTION
FIGURE 2-8

Proj. #: D0136-082-033 | File: D:\ACAD\SAFFORD\DAMES | Drawing: A09481.DWG | Drwn by: DS | Chk'd by: TER | Date: 04-21-97 | Rev: 4-20-98

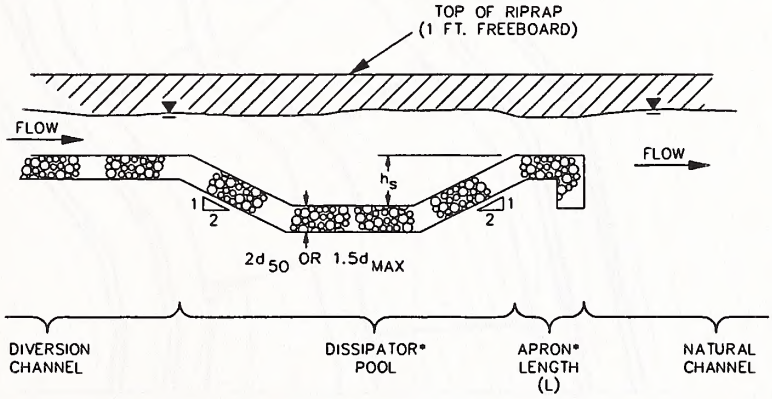


W_{IN} = WIDTH IN DIVERSION CHANNEL @ 100 YEAR FLOW

W_{OUT} = WIDTH OF NATURAL CHANNEL WITH NORMAL DEPTH FOR 100 YEAR FLOW

NOT TO SCALE

PLAN VIEW

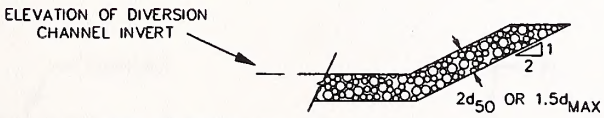


*NOTES: 1) APRON LENGTH IS LARGEST OF W_{IN} OR $5h_S$, PER TABLE 3.

2) DISSIPATOR POOL IS LARGEST OF $3W_{IN}$ OR $10h_S$, PER TABLE 3.

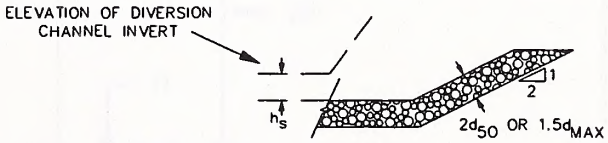
NOT TO SCALE

CENTERLINE SECTION



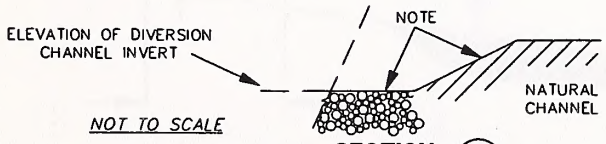
NOT TO SCALE

SECTION A



NOT TO SCALE

SECTION B



NOT TO SCALE

SECTION C

NOTE: WARP BASIN TO CONFORM TO NATURAL CHANNEL. TOP OF RIPRAP IN FLOOR OF BASIN SHOULD BE AT THE SAME ELEVATION OR LOWER THAN NATURAL CHANNEL BOTTOM AT SECTION C.

SECTIONS

PRELIMINARY
NOT FOR CONSTRUCTION OR RECORDING

DOS POBRES/SAN JUAN PROJECT

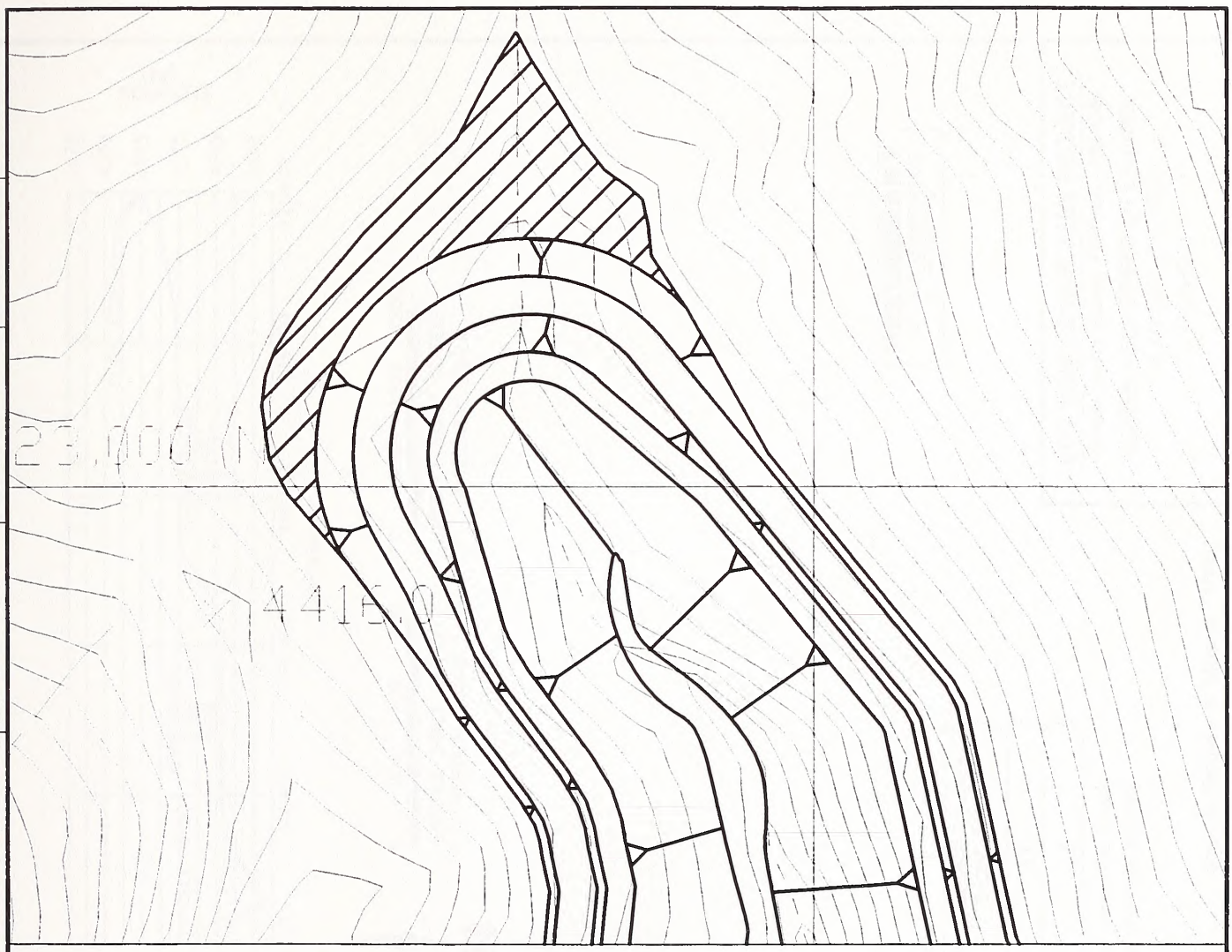
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

TYPICAL RIPRAP-REINFORCED CHANNEL TRANSITION

FIGURE 2-9

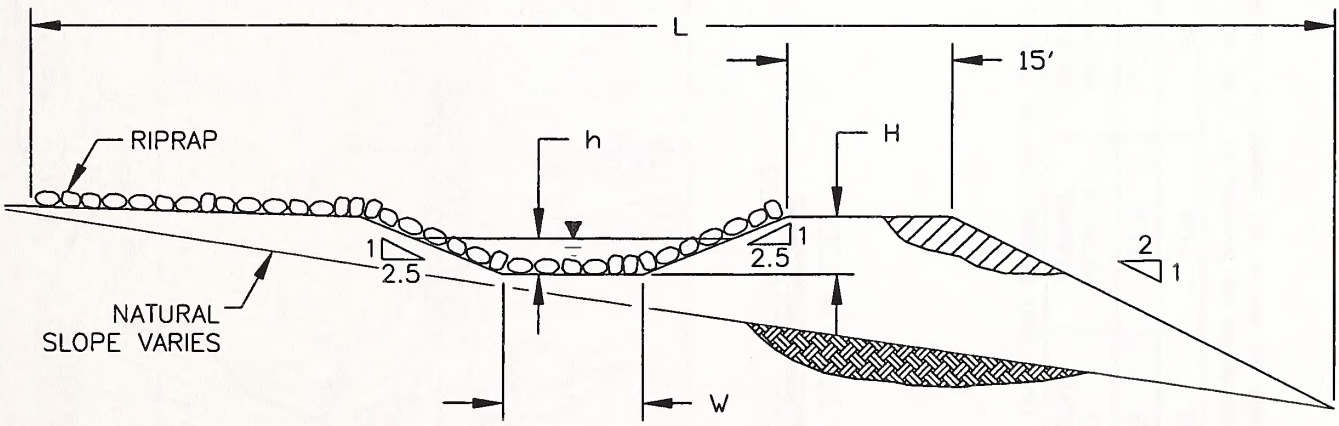
Source: Dames & Moore 1998C

Rev: 4-29-98 | Date: 04-29-97 | Chk'd by: TER | Drwn by: DS | Drawing: A09555.DWG | File: D:\CAD\SAFFORD\DAMES\ | Proj. #: 00136-082-033



0 50 100 150

Scale in Feet



NOTE: FOR DIMENSIONS SEE TABEL 2-4

LEGEND

GROUND

FILL MATERIAL

PRELIMINARY
NOT FOR CONSTRUCTION
OR RECORDING

Source: Dames & Moore 1998C

DOS POBRES/SAN JUAN PROJECT

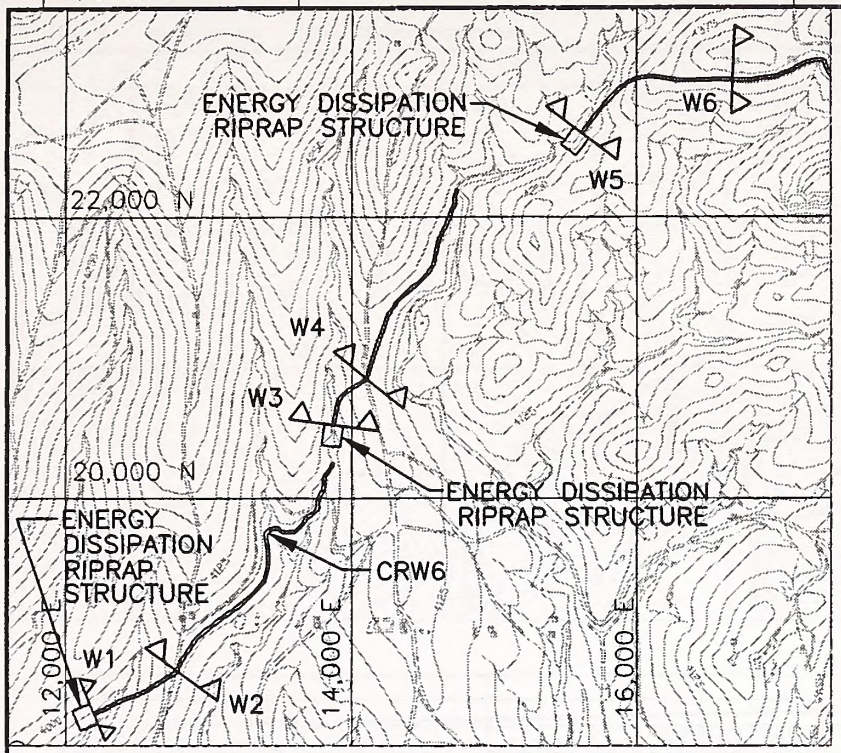
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

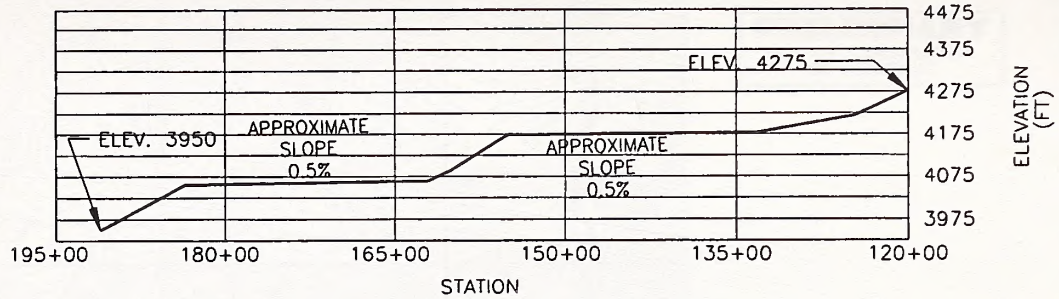
PLAN VIEW AND TYPICAL CROSS-SECTION
FOR CURVE REDUCTION ALIGNMENTS

FIGURE 2-10

Proj. #: 00136-082-033 File: C:\ACAD\SAFFORD\DAMES\ Drawing: A09510.DWG Xref: Tile-035.dwg Drawn by: DS Chk'd by: TER Date: 04-25-97 Rev: 4-29-98

Proj. #: 00136-082-D33 | File: D:\ACAD\SAFFORD\DAMES | Drawing: AD9516.DWG XREF:XTDPD | Drwn by: DS | Chk'd by: TER | Date: 04-29-97 | Rev: 4-29-98





N

0 200 400 600
PROFILE SCALE IN FEET
VERTICAL SCALE

0 750 1500 2250
PROFILE SCALE IN FEET
HORIZONTAL SCALE

0 750 1500 2250
PLAN SCALE IN FEET

PRELIMINARY
NOT FOR CONSTRUCTION OR RECORDING

Lower West Diversion Channel Cross-Section Details

CROSS SECTION	FLOW DEPTH (ft)	CHANNEL DEPTH (ft)	CHANNEL BED WIDTH (ft)	AVE. NATURAL GROUND SLOPE (ft)
W2	9.58	11.5	20	5.0
W4	8.91	11.0	20	4.0

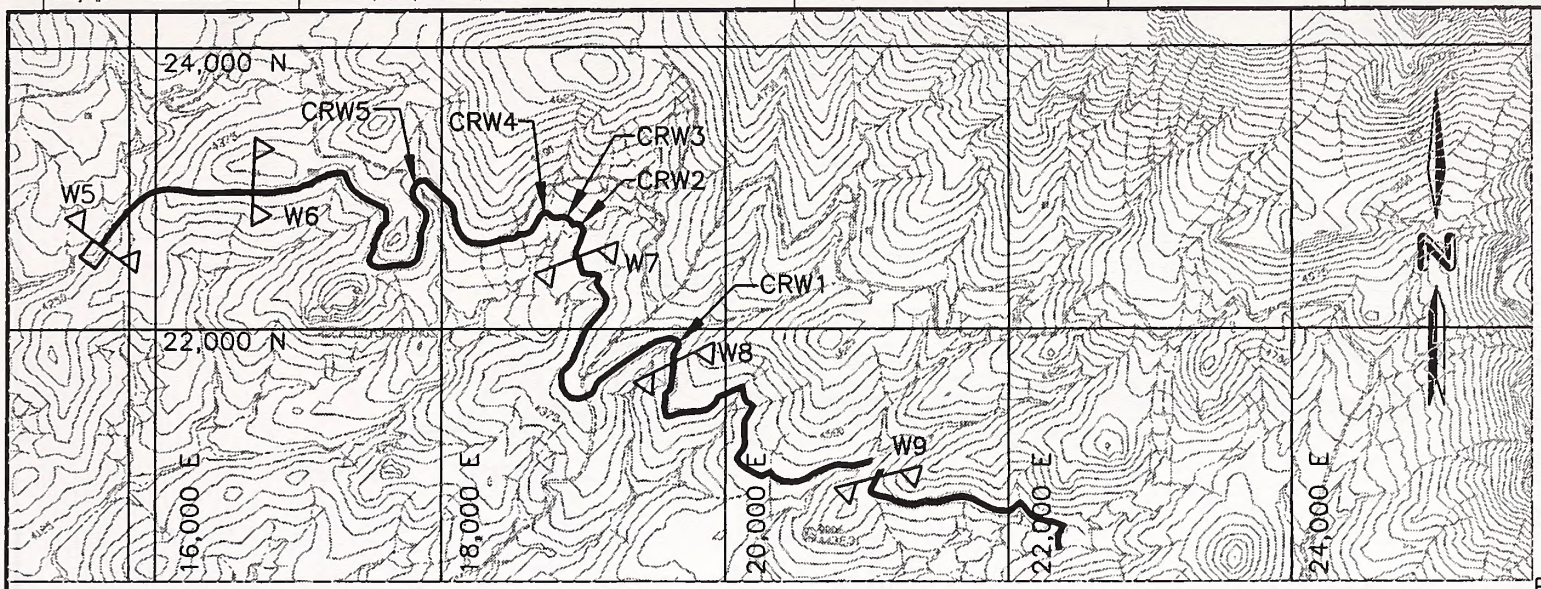
Note: Flows and channel depths for Sections W1 & W3 will vary due to numerous slope changes along the section but should not exceed the flow depth of the previous section

Source: Dames & Moore 1998C

DOS POBRES/SAN JUAN PROJECT
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

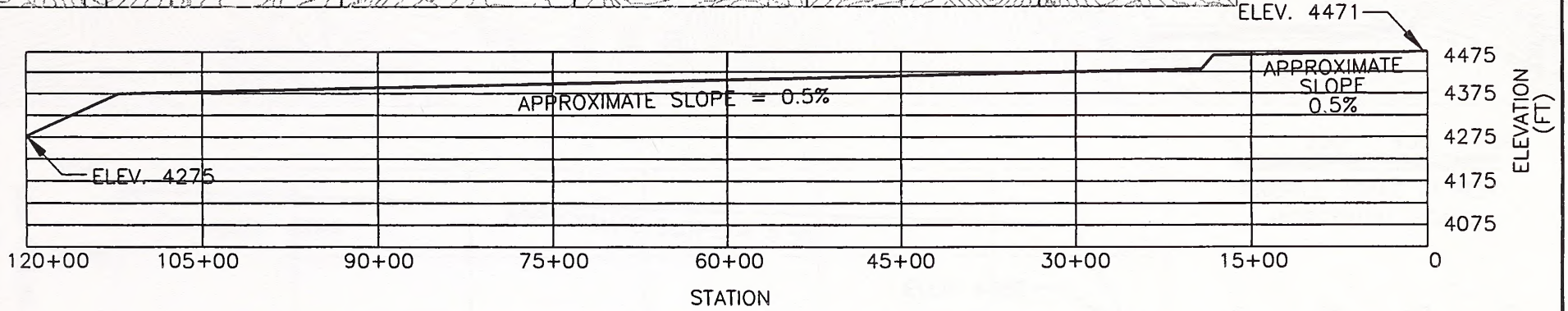
LOWER WEST DIVERSION CHANNEL
PLAN AND PROFILE
FIGURE 2-11

Proj. #:	00136-082-033	File:	D:\ACAD\SAFFORD\DAMES	Drawing:	AD9483.DWG XREF:XTOPO	Drwn by:	DS	Chk'd by:	TER	Date:	04-29-97	Rev:	4-29-98



PRELIMINARY
NOT FOR CONSTRUCTION OR RECORDING

0 750 1500 2250
PLAN SCALE IN FEET



0 200 400 600
PROFILE SCALE IN FEET
VERTICAL SCALE

0 750 1500 2250
PROFILE SCALE IN FEET
HORIZONTAL SCALE

Upper West Diversion Channel Cross-Section Details

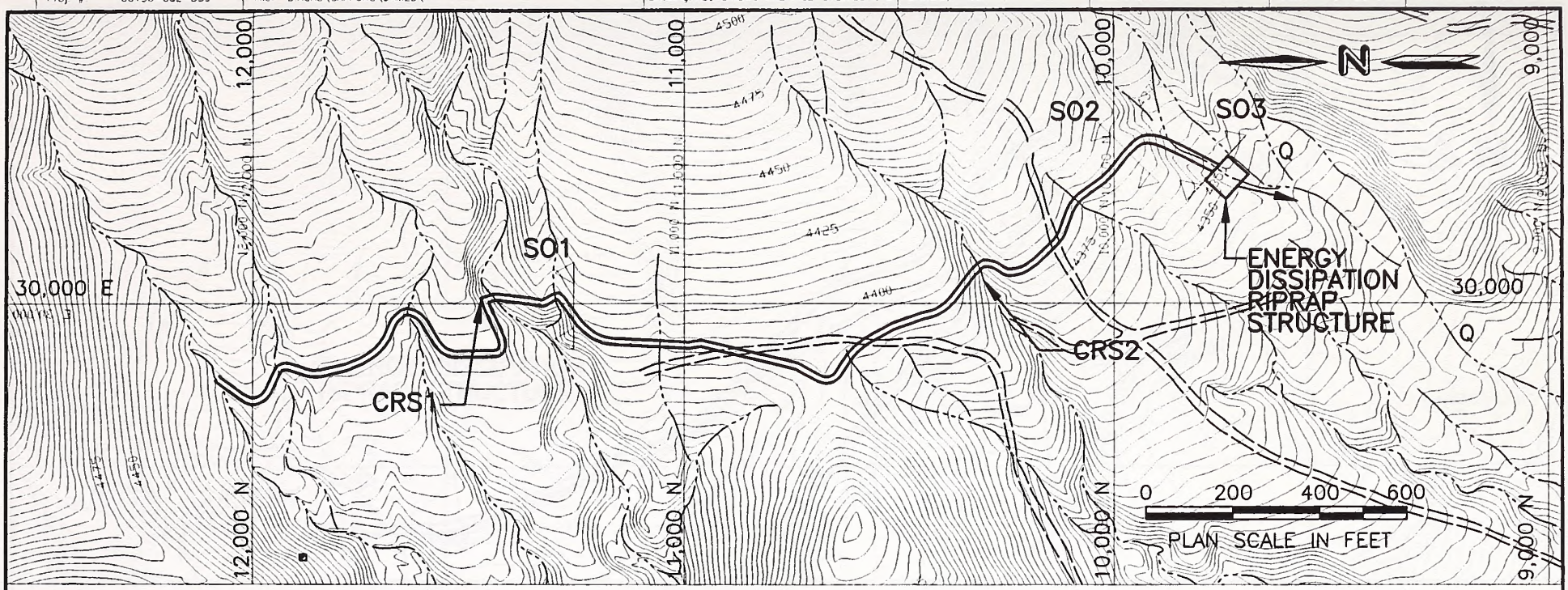
CROSS SECTION	FLOW DEPTH (ft)	CHANNEL DEPTH (ft)	CHANNEL BED WIDTH (ft)	AVE. NATURAL GROUND SLOPE (ft)
W6	5.66	7.0	20	2.5
W7	5.18	6.5	20	3.0
W8	4.27	5.5	20	3.3
W9	2.65	4.0	20	2.5

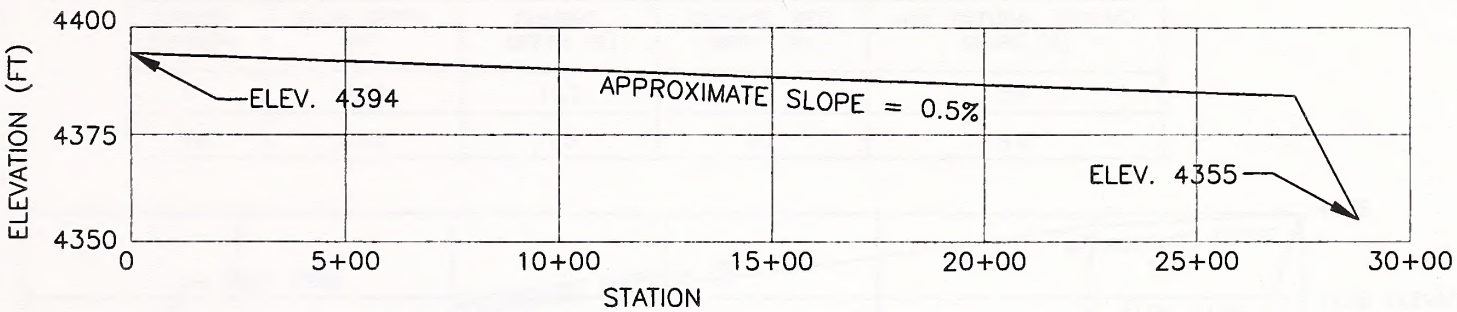
Note: Flow channel depths for W5 will vary due to the numerous slope changes along the section length but should not exceed the flow depth of the previous section.

Source: Dames & Moore 1998C

DOS POBRES/SAN JUAN PROJECT
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.
UPPER WEST DIVERSION CHANNEL
PLAN AND PROFILE
FIGURE 2-12

Proj # 00136-082-D33 | File: D:ACAD\SAFFORD\DAMES\ | Drawing: A09484.DWG XREF:TILE-078,TILE-079 | Drwn by: DS | Chk'd by: TER | Date: 04-28-97 | Rev: 4-29-98





0 200 400 600
PROFILE SCALE IN FEET
HORIZONTAL SCALE

0 25 50 75
PROFILE SCALE IN FEET
VERTICAL SCALE

South Diversion Channel Cross-Section Detoils

CROSS SECTION	FLOW DEPTH (ft)	CHANNEL DEPTH (ft)	CHANNEL BED WIDTH (ft)	AVE. NATURAL GROUND SLOPE (ft)
SO1	3.64	5.0	15	7.5
SO2	4.89	6.0	15	6.0

Note: Flow and channel depths for Section SO3 will vary due to numerous slope changes along the section length but should not exceed the flow length of the previous section.

Source: Dames & Moore 1998C

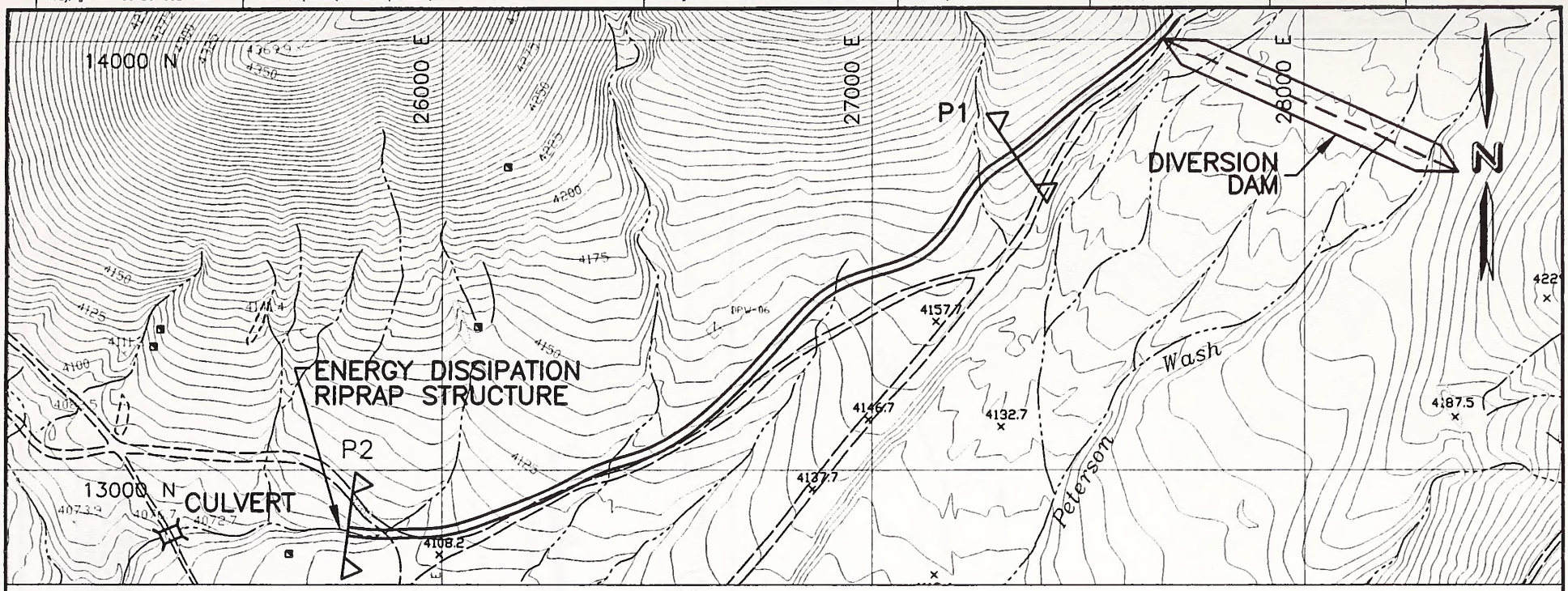
PRELIMINARY
NOT FOR CONSTRUCTION OR RECORDING

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

SOUTH DIVERSION CHANNEL
PLAN AND PROFILE
FIGURE 2-13

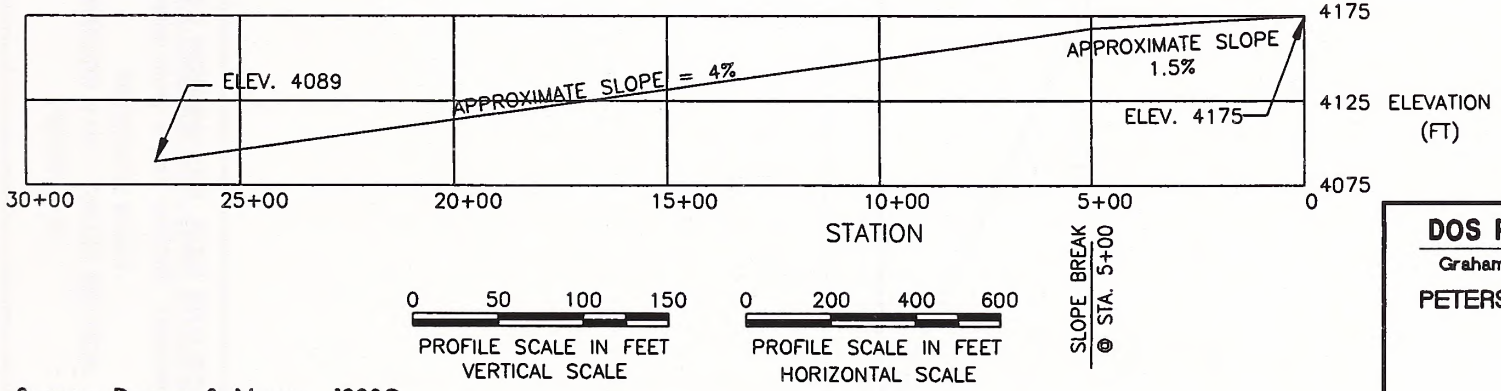
Proj. #: 00136-082-D33	File: D:\ACAD\SAFFORD\DAMES\	Drawing: A09485.DWG XREF:TILE-064,082-SITE	Drwn by: DS	Chk'd by: TER	Date: 04-21-97	Rev: 4-29-98



Peterson Wash Diversion Channel Cross-Section Details

CROSS SECTION	FLOW DEPTH (ft)	CHANNEL DEPTH (ft)	CHANNEL BED WIDTH (ft)	AVE. NATURAL GROUND SLOPE (ft)
P1	8.18	10.0	20	5.0
P2	6.04	7.5	20	9.0

0 200 400 600
PLAN SCALE IN FEET

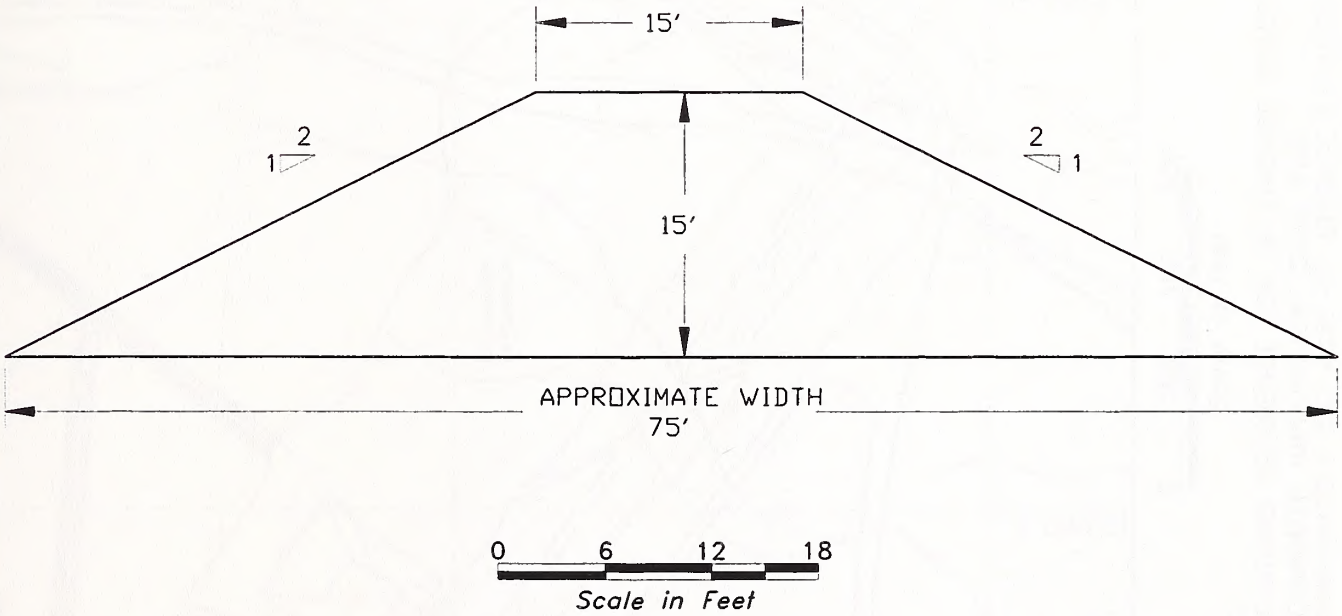


PRELIMINARY
NOT FOR CONSTRUCTION OR RECORDING

Source: Dames & Moore 1998C

DOS POBRES/SAN JUAN PROJECT
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

PETERSON WASH DIVERSION CHANNEL
PLAN AND PROFILE
FIGURE 2-14



PRELIMINARY
NOT FOR CONSTRUCTION
OR RECORDING

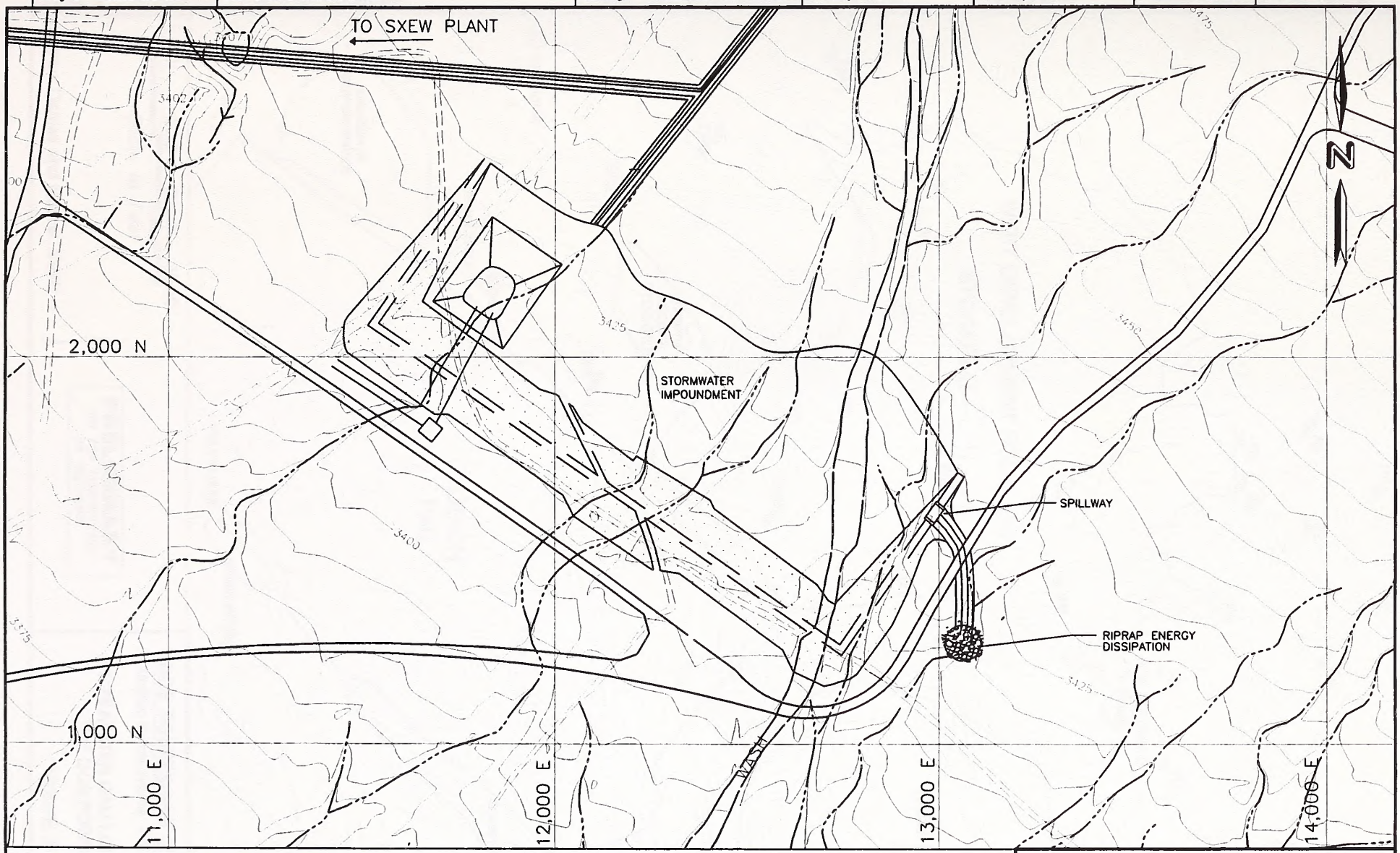
Source: Dames & Moore 1998C

DOS POBRES/SAN JUAN PROJECT
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

PETERSON WASH
DIVERSION DAM - CROSS SECTION
FIGURE 2-15

Proj. #: 00136-082-033 | File: D:\ACAD\SAFFORD\DAMES | Drawing: A09492.DWG | Drawn by: DS | Chk'd by: TER | Date: 04-21-97 | Rev: 4-29-98

Proj. #: 00136-082-033	File: D:\ACAD\SAFFORD\DAMES	Drawing: A06524.DWG XREF: XSITES	Drwn by: KLP	Chk'd by: TER	Date: 04-23-97	Rev: 7-16-98



PRELIMINARY
NOT FOR CONSTRUCTION OR RECORDING

0 200 400 600
Scale in Feet

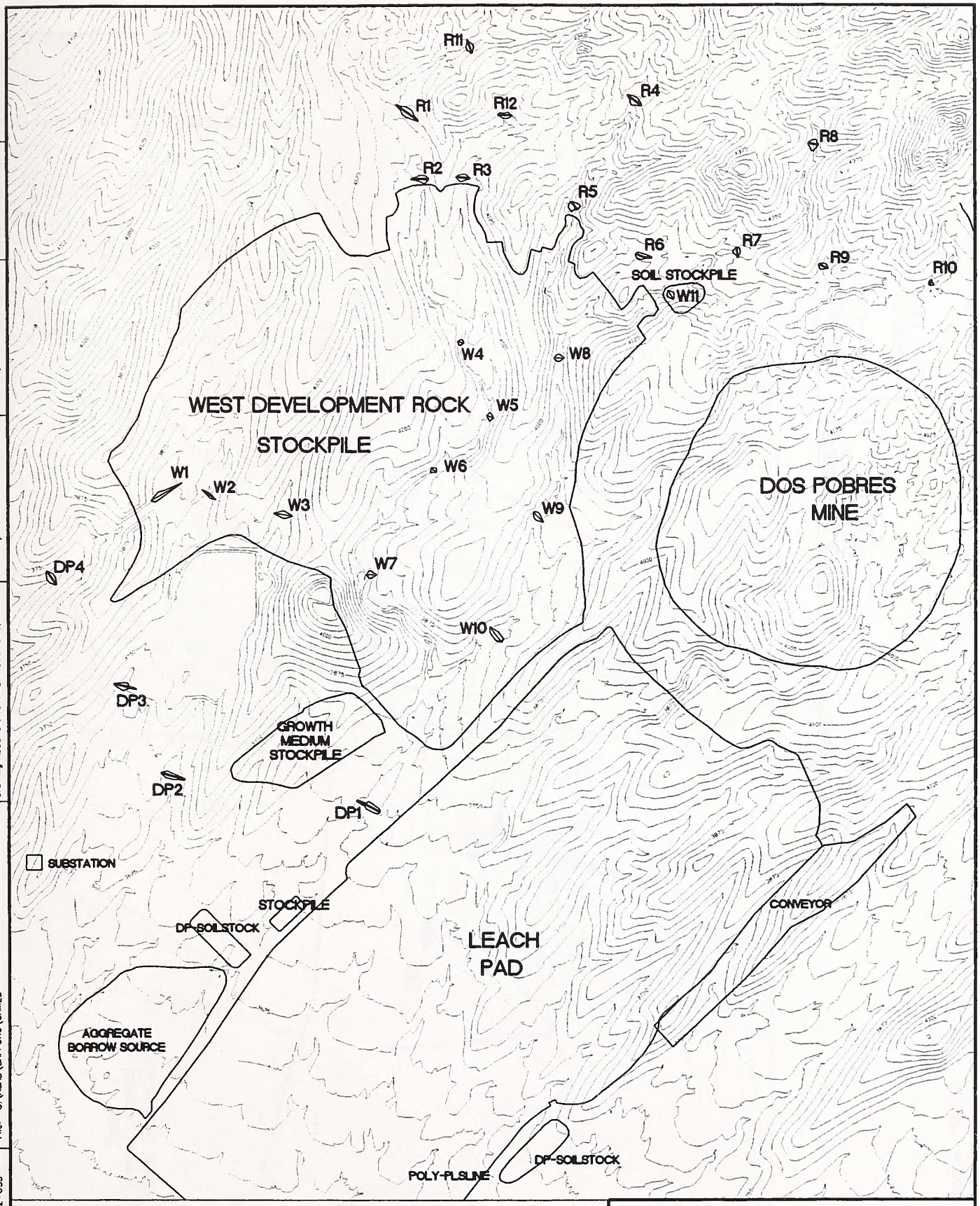
NOTES:
1. ELEVATIONS REFERENCE TOP OF FINISHED GRADE.
2. STORMWATER IMPOUNDMENT SIZED FOR APPROXIMATELY 332 ACRE-FT STORAGE CAPACITY.

Source: Dames & Moore 1998B

DOS POBRES/SAN JUAN PROJECT
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

STORMWATER IMPOUNDMENT PLAN VIEW

FIGURE 2-16



0 500 2000 2500

Scale in Feet

PRELIMINARY
NOT FOR CONSTRUCTION
OR RECORDING

Source: Dames and Moore 1998C

DOS POBRES/SAN JUAN PROJECT

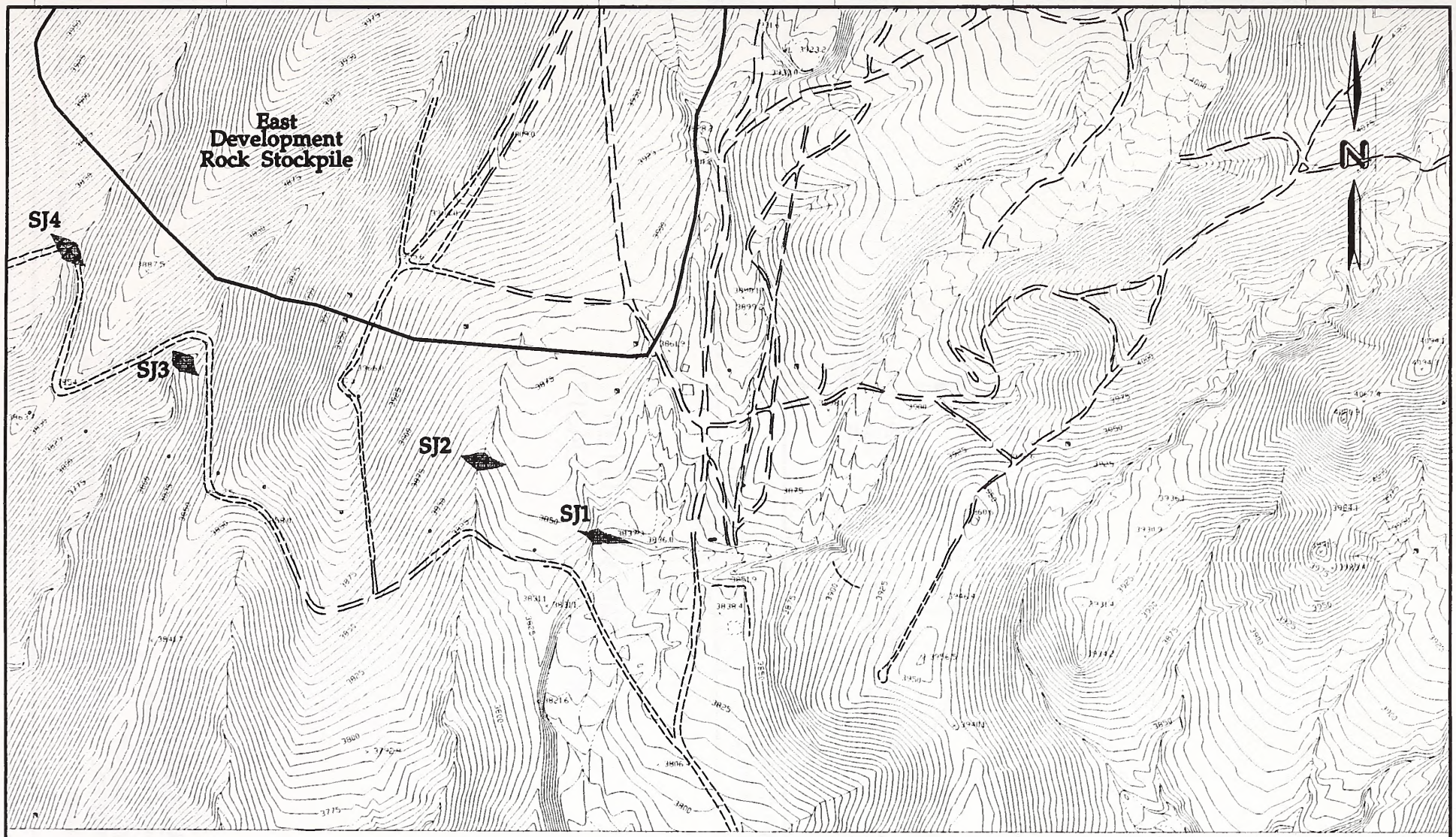
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

STORMWATER DAM LOCATIONS WITHIN
THE DOS POBRES AREA

FIGURE 2-17

Proj. #: 00136-082-033 | File: G:\ACAD\SAFFORD\DAMES | Drawing: A09543.DWG XREF:082-SITE.XTOPO | Drwn by: OS | Chk'd by: TER | Date: 04-25-97 | Rev: 9-1-98

Proj. #: 00136-082-033 | File: O:ACAD\SAFFORD\DAMES\ | Drawing: A09525.DWG XREF:082-SITE | Drwn by: DS | Chk'd by: TEP | Date: 04-24-97 | Rev: 4-29-98



LEGEND:

DAM

0 1000 2000 2500

Scale in Feet

PRELIMINARY
NOT FOR CONSTRUCTION
OR RECORDING

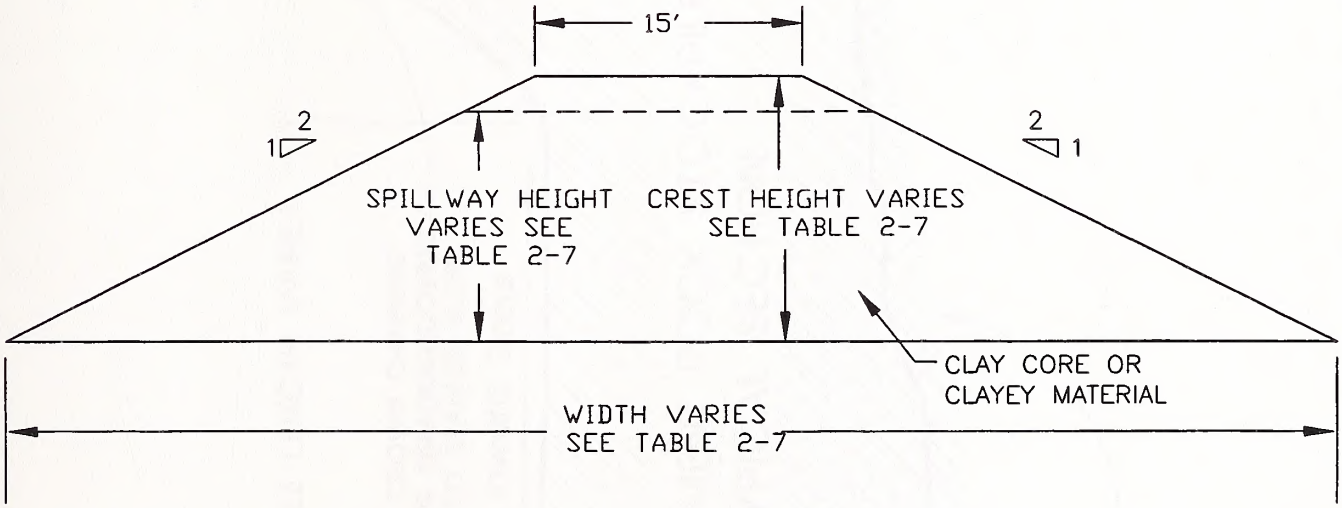
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

RETENTION DAMS DOWNSTREAM OF
EAST DEVELOPMENT ROCK STOCKPILE

FIGURE 2-18

Source: Dames & Moore 1998C



RETENTION DAM
TYPICAL CROSS SECTION

PRELIMINARY
NOT FOR CONSTRUCTION OR RECORDING

0 6 12 18
Scale in Feet

Source: Dames & Moore 1998

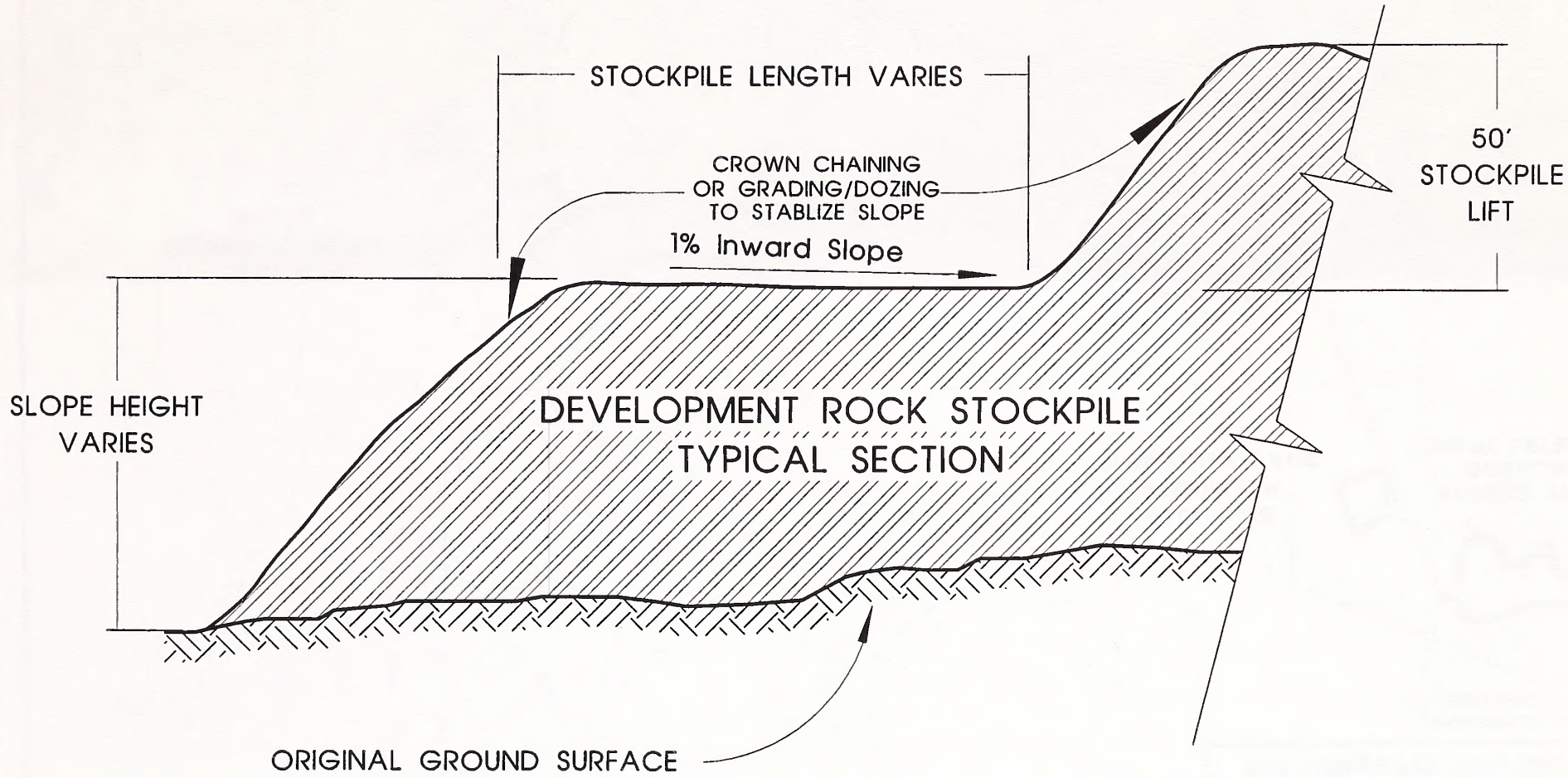
DOS POBRES/SAN JUAN PROJECT
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

TYPICAL CROSS SECTION
RETENTION DAM

FIGURE 2-19

Proj. #: 00136-D82-D33 | File: D:\ACAD\SAFFORD\DAMES\ | Drawing: XSECT.DWG | Drwn by: DS | Chk'd by: TER | Date: 04-28-97 | Rev: 4-29-98

Proj. #: 51-61700	File: D:\Acad\Safford\Drawings	Drawing: DEVRXSTOK.DWG	Drwn by: KAD	Chk'd by:	Date: 10-30-97	Rev: Date 5-28-98

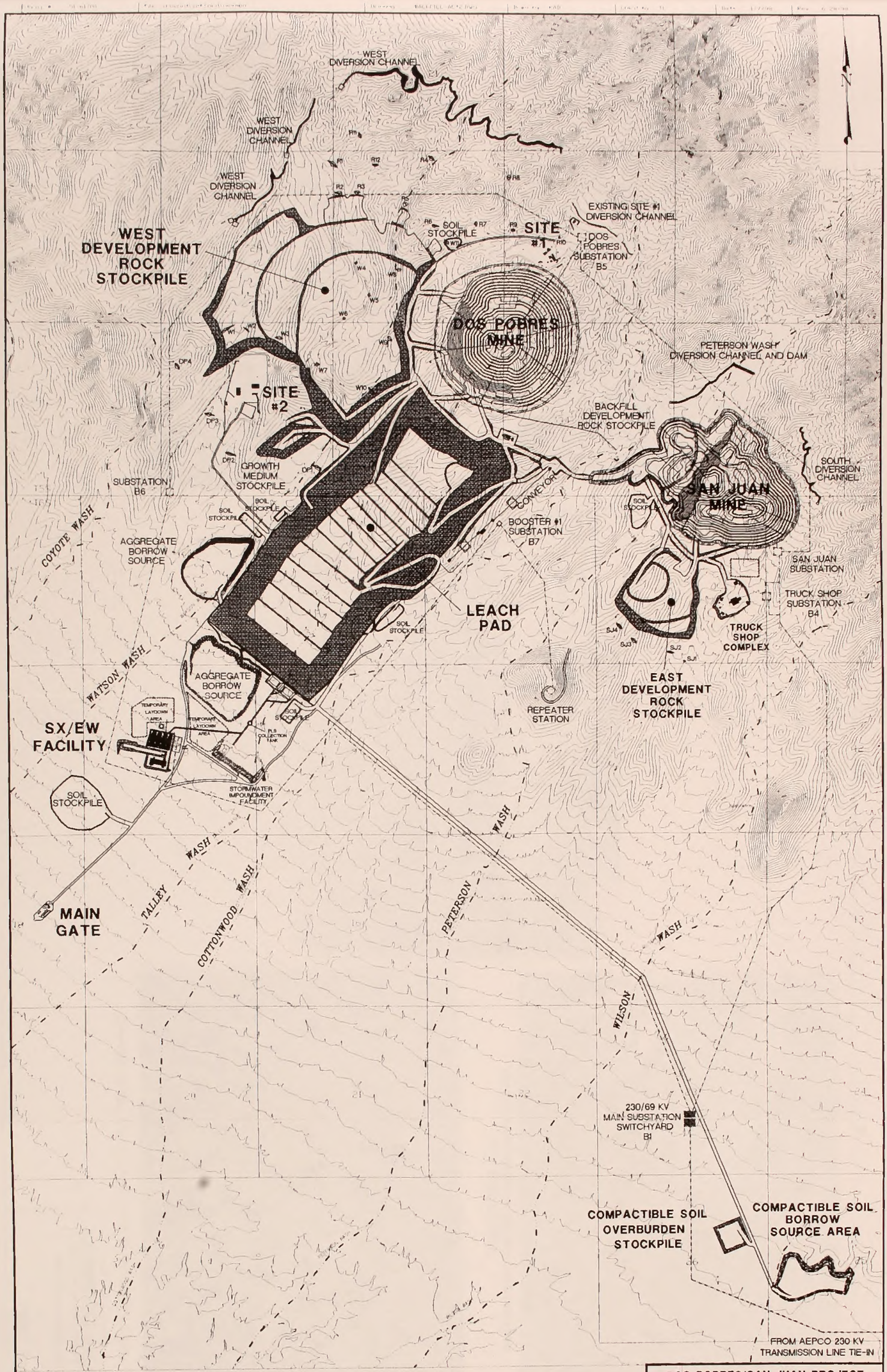


DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona

DEVELOPMENT ROCK STOCKPILE SLOPE
TYPICAL SECTION

FIGURE 2-20



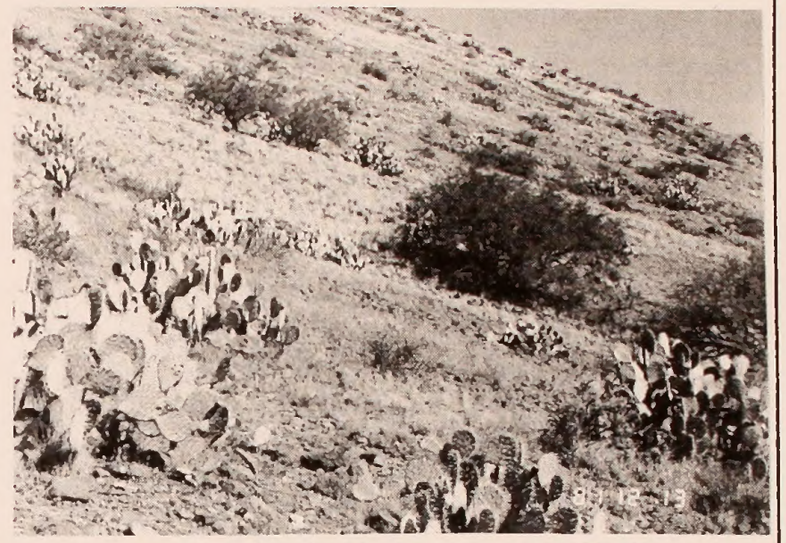
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

PARTIAL BACKFILL ALTERNATIVE

FIGURE 2-21

View from selected lands looking south, toward Safford Valley.



Semi-Desert Grassland habitat on selected lands near Soloman Pass.

Office building on 12-acre parcel north of Sanchez.

View of selected lands looking north toward Gila Mountains.

Overview of Site 1 area looking south toward Safford Valley.

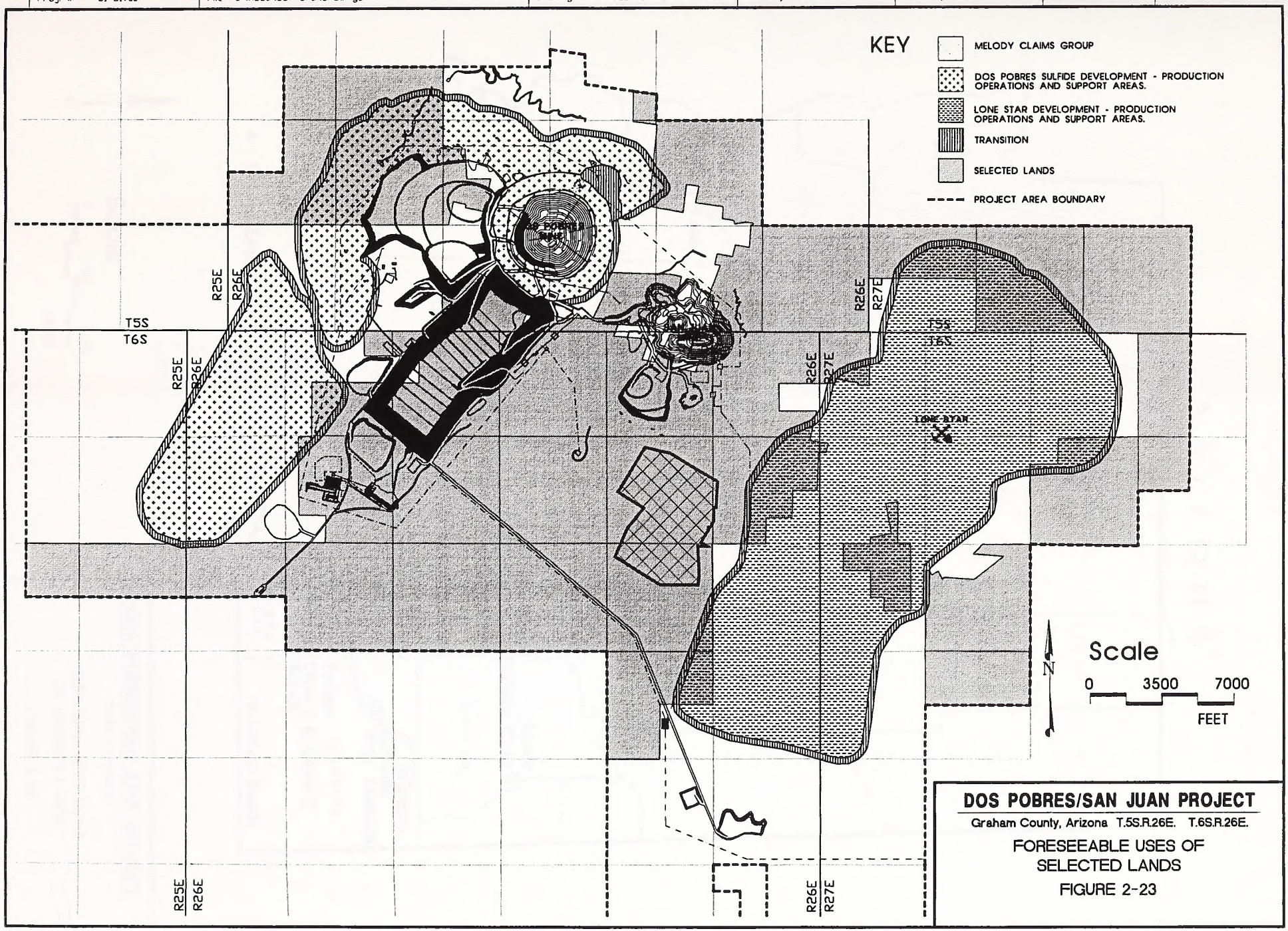
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

SELECTED LANDS PHOTOS

FIGURE 2-22

Proj. #: 51-61700	File: D:\Acad\Safford\Drawings	Drawing: FUSELAND.DWG	Drwn by: KAD	Chk'd by:	Date: 10-25-97	Rev: 6-4-98

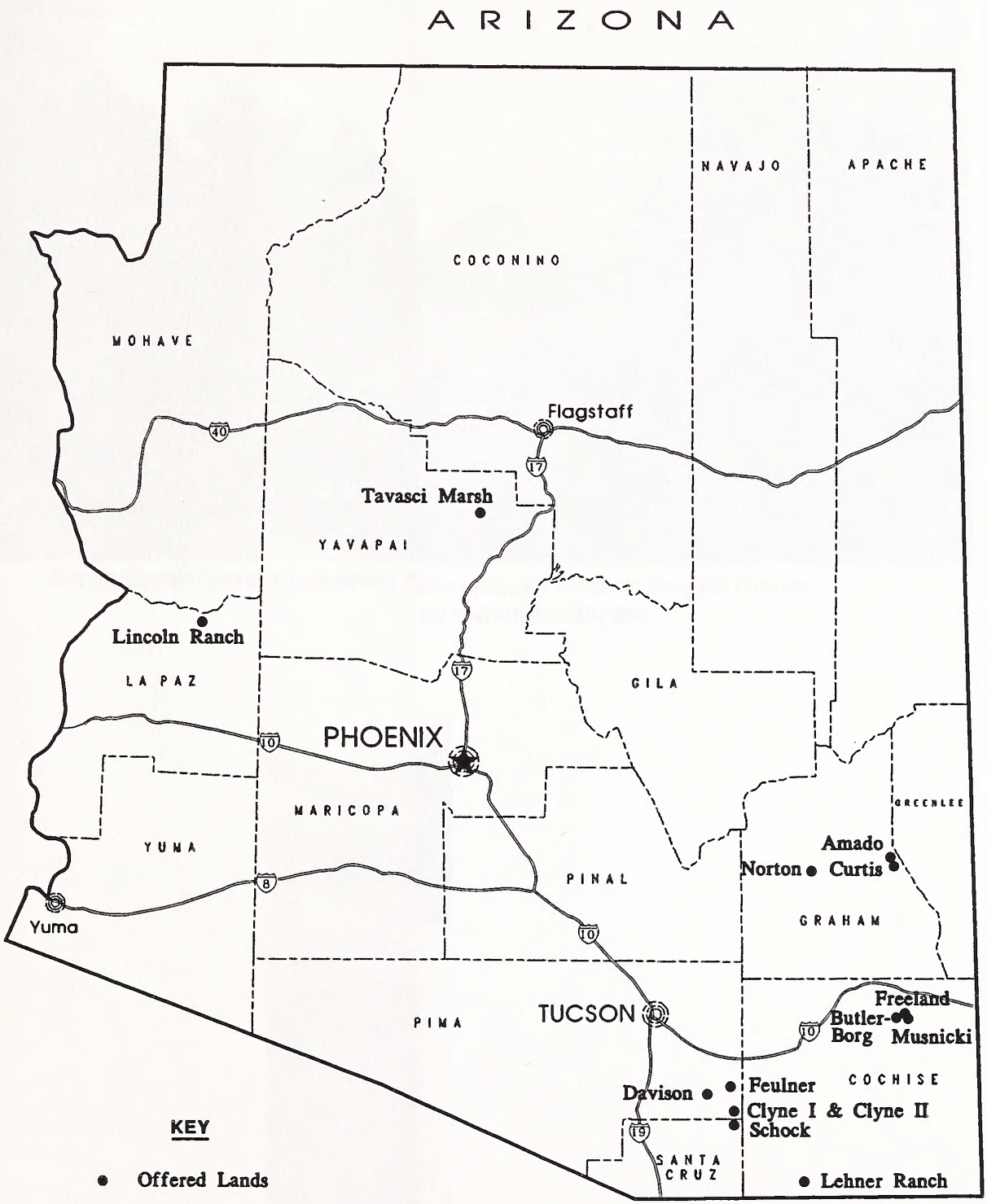


DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

FORESEEABLE USES OF SELECTED LANDS

FIGURE 2-23



DOS POBRES/SAN JUAN PROJECT

State of Arizona

REGIONAL LOCATIONS OF OFFERED LANDS

FIGURE 2-24

Proj. # 51-61700 | File: D:\Acadll\Safford\Off_land | Drawing: Location | Drawn by: RW\KAD | Chk'd by: TL | Date: 6-19-96 | Rev 4-29-98

Bonita Creek riparian vegetation habitat on Amado Property

Bonita Creek perennial riparian habitat on Curtis Property

Semi-Desert Grassland habitat on Schock Property, looking toward Mt Bruces.

Sonoran Desertscrub habitat on Musnicki Property.

Xeroriparian habitat on Feulner Property

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

BASE PACKAGE OF OFFERED LANDS PHOTOS

FIGURE 2-25

Sonoran Interior Marshlands at Tavasci Marsh Property.

Sonoran Desertscrub habitat on Freeland Property.

Sonoran Desertscrub habitat on Clyne I Property.

Sonoran Desertscrub habitat on Bulter-Borg Property.

Semi-Desert Grassland habitat on Clyne II Property.

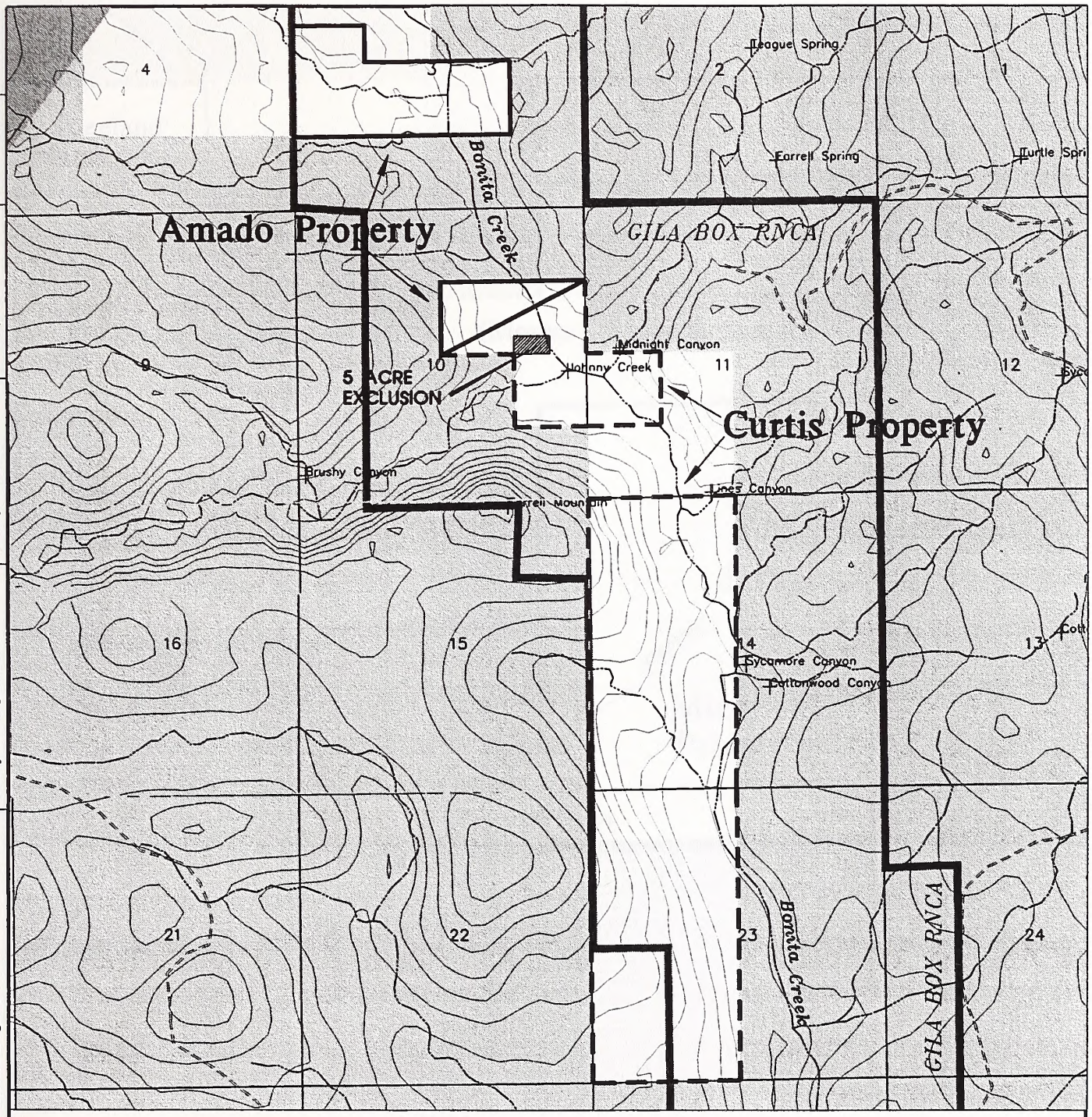
Xeroriparian habitat on Norton Property.

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

OPTIONAL PACKAGE OFFERED LANDS PHOTOS

FIGURE 2-26

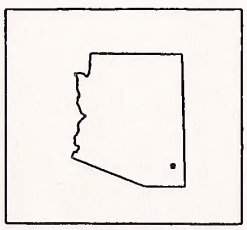


KEY

- DIRT ROAD
- DRAINAGE
- AMADO BOUNDARY
- CURTIS BOUNDARY
- RCNA BOUNDARY
- BLM LAND
- SAN CARLOS INDIAN RESERVATION
- PRIVATE LAND

Scale
0 1500 3000
FEET

LOCATION MAP



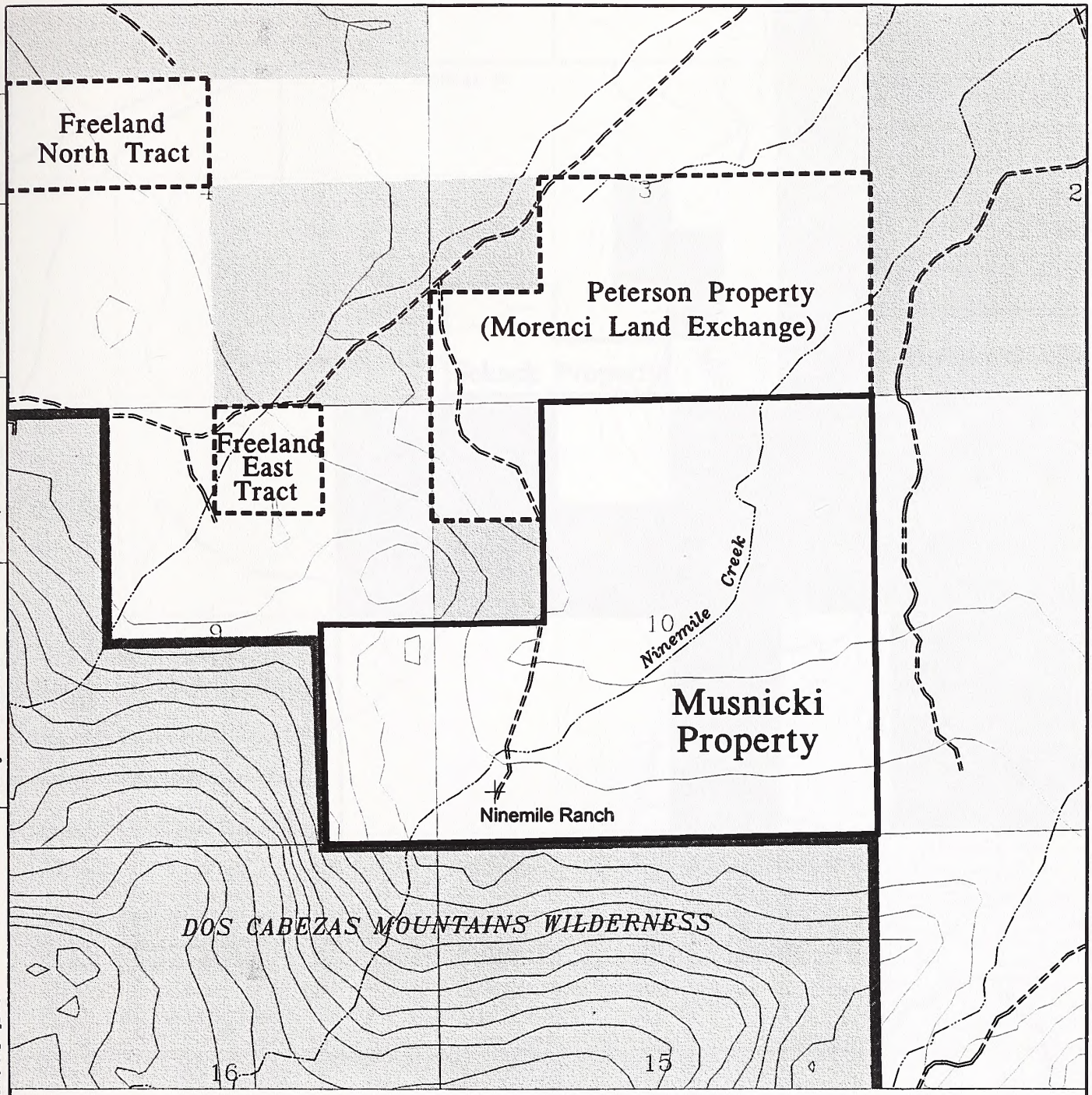
USGS 7.5' QUADRANGLE:
BONITA SPRING, ARIZ.

DOS POBRES/SAN JUAN PROJECT
Graham County, Arizona T.5S.,R.27E.

AMADO AND CURTIS PROPERTIES
OFFERED LANDS

FIGURE 2-27

Rev: 4-29-98
Date: 8-16-97
Chk'd by: TL
Drwn by: KAD/JLJ
Drawing: AMA_CURT.DWG
File: D:\Acad\Safford\DFF_LAND
Proj. #: 1700-M-21



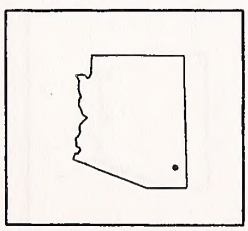
KEY

- DIRT ROADS
- EPHEMERAL DRAINAGES
- MUSNICKI PROPERTY BOUNDARY
- OTHER OFFERED LANDS PROPERTY BOUNDARY
- WILDERNESS BOUNDARY
- BLM LAND
- PRIVATE LAND

N

Scale
0 1000 2000
FEET

LOCATION MAP



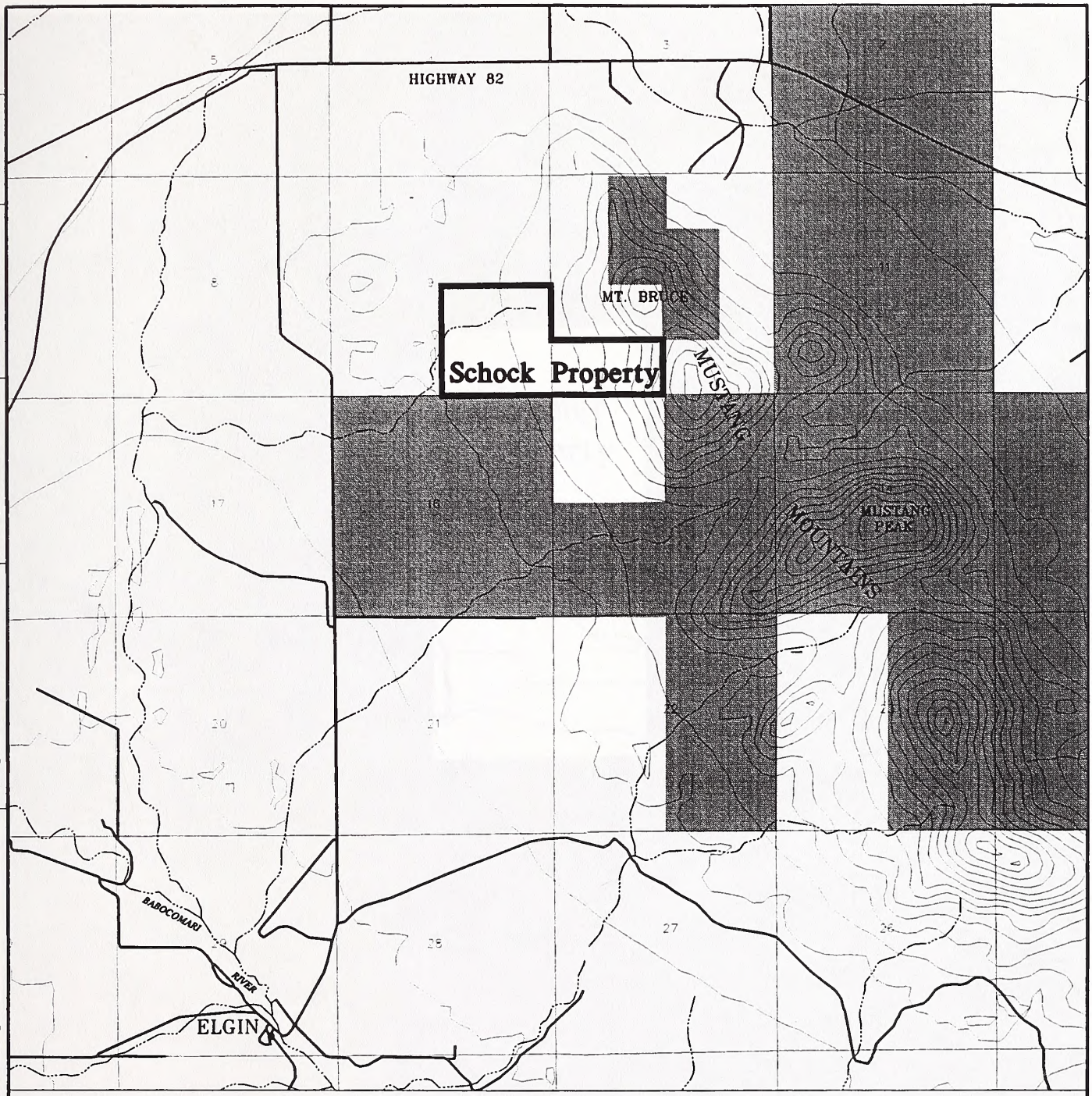
USGS 7.5' QUADRANGLE:
BOWIE MTN. NORTH, ARIZ.

DOS POBRES/SAN JUAN PROJECT
Cochise County, Arizona T.14S.,R.28E.

MUSNICKI PROPERTY
OFFERED LANDS

FIGURE 2-28

Rev: 4-29-98 | Date: 8-16-97 | Chk'd by: TL | Drawn by: KAD/JLJ | Drawing: MUSNICKI.DWG | File: D:\Acad\Safford\OFF_LAND | Proj #: 1700-M-21



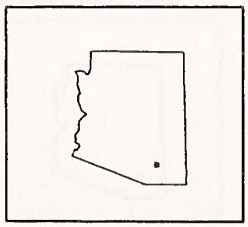
KEY

- ROADS
- EPHEMERAL DRAINAGES
- PROPERTY BOUNDARY
- STATE LAND
- PRIVATE LAND

N

Scale
0 2000 4000
FEET

LOCATION MAP



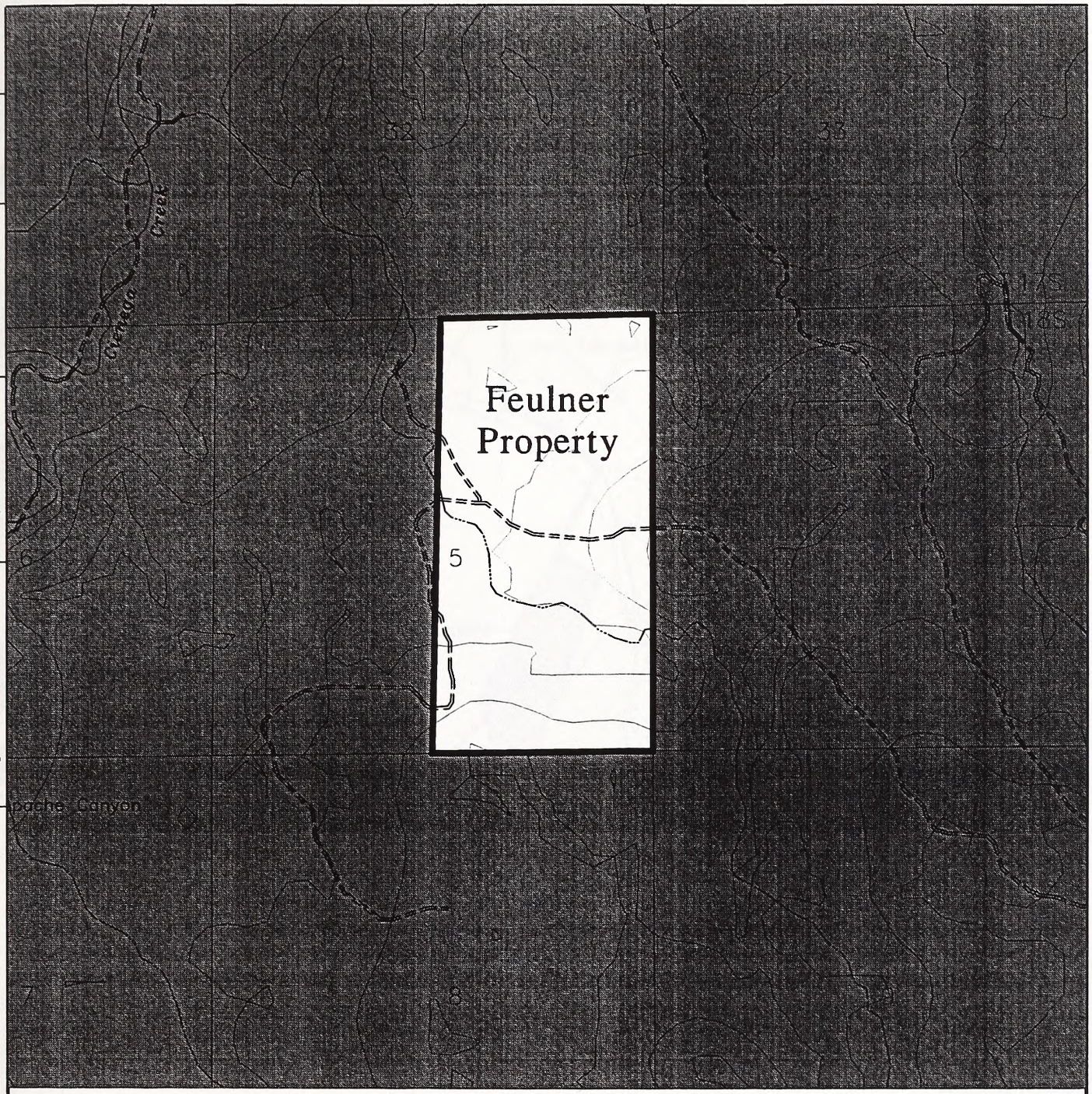
USGS 7.5' QUADRANGLE:
ELGIN, MUSTANG MOUNTAINS, ARIZ.

DOS POBRES/SAN JUAN PROJECT
Santa Cruz County, Arizona T.20S.,R.18E.

SCHOCK PROPERTY
OFFERED LANDS

FIGURE 2-29

Proj #: 1700-M-21 | File: D:\Acad\Safford\DFF_LAND | Drawing SCHOCK.DWG | Drawn by: KAD/JLJ | Chk'd by: TL | Date: 8-16-97 | Rev: 6-4-98



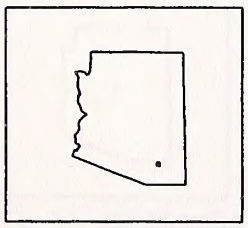
KEY

- DIRT ROAD
- EPHEMERAL DRAINAGE
- PROPERTY BOUNDARY
- STATE LAND
- PRIVATE LAND

N

Scale
0 1000 2000
FEET

LOCATION MAP



USGS 7.5' QUADRANGLE:
THE NARROWS, ARIZ.

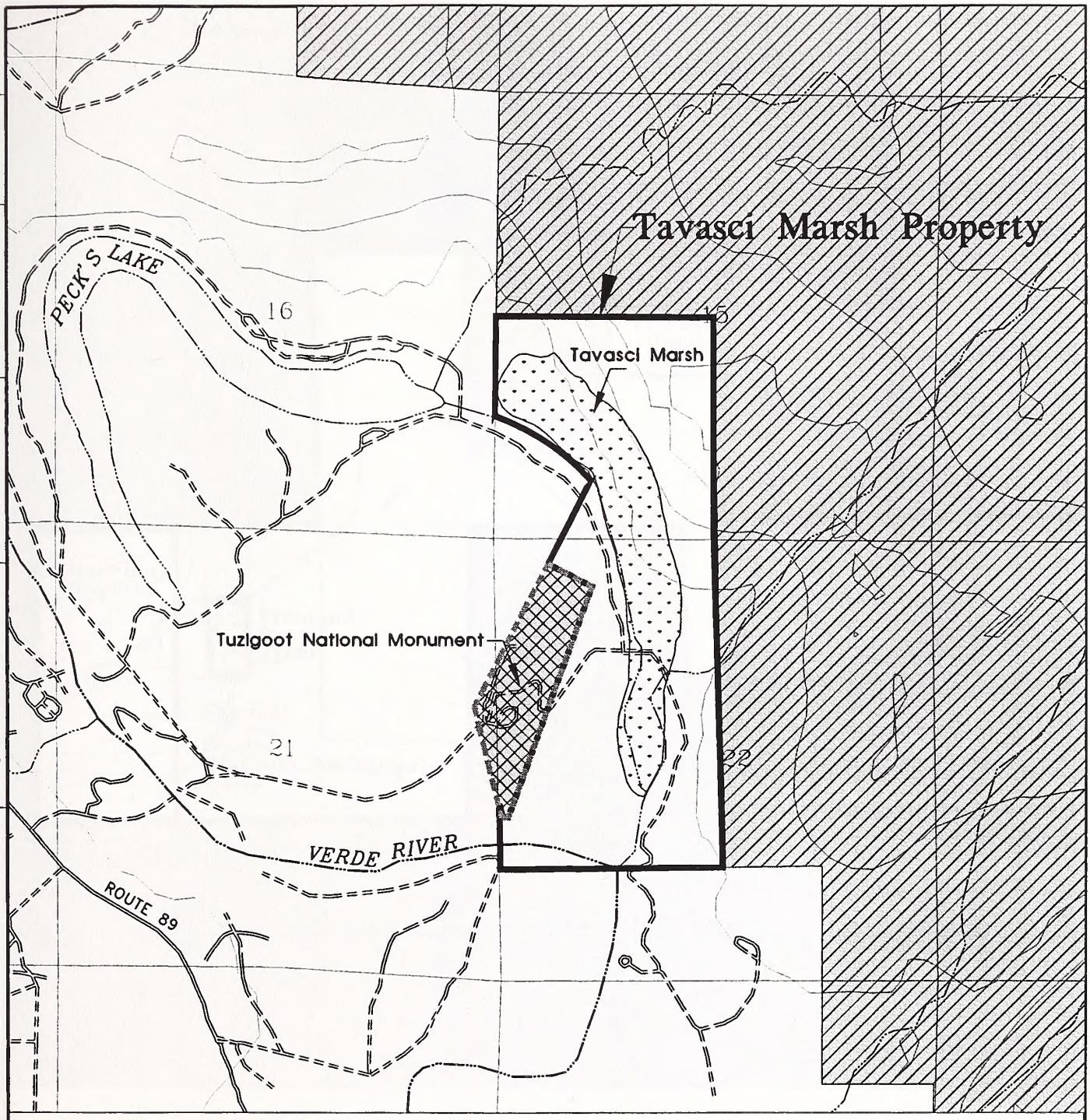
DOS POBRES/SAN JUAN PROJECT

Pima County, Arizona T.18S.,R.19E.

FEULNER PROPERTY
OFFERED LANDS

FIGURE 2-30

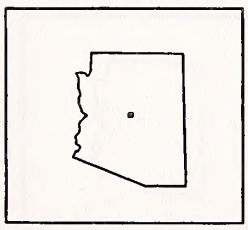
Proj. #: 1700-M-21 | File: D:\Acad\Safford\OFF_LAND | Drawing: FEULNER.DWG | Drwn by: KAD/JLJ | Chk'd by: TL | Date: 8-16-97 | Rev: 4-29-98



KEY

- DIRT ROADS
- MAJOR RIVER
- EPHEMERAL DRAINAGES
- PROPERTY BOUNDARY
- TUZIGOOT NATIONAL MONUMENT BOUNDARY
- NPS LAND
- USFS LAND
- PRIVATE LAND

LOCATION MAP



USGS 7.5' QUADRANGLE
CLARKDALE, ARIZ.

N

Scale
0 1000 2000
FEET

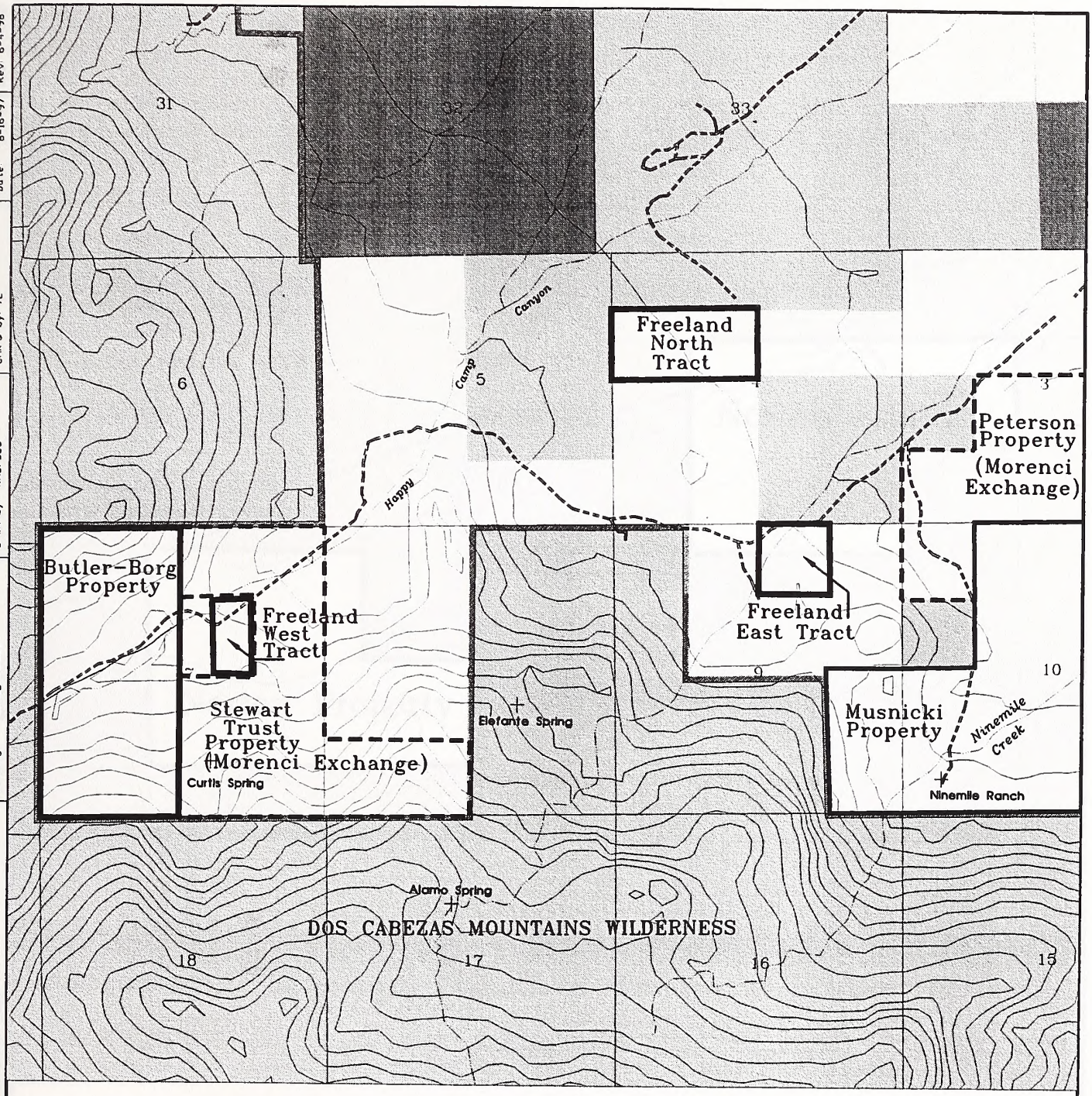
DOS POBRES/SAN JUAN PROJECT

Yavapai County, Arizona T.16N.R.3E.

TAVASCI MARSH PROPERTY
OFFERED LANDS

FIGURE 2-31

Proj. #: 1700-H-21 | File: D:\Acad\Safford\DFF_LAND | Drawing: TAVASCI.DWG | Drawn by: KAD/JLJ | Chk'd by: TL | Date: 8-16-97 | Rev: 4-29-98



KEY

- DIRT ROADS
- EPHEMERAL DRAINAGES
- PROPERTY BOUNDARIES
- MORENCI EXCHANGE OFFERED LANDS
- WILDERNESS BOUNDARY
- BLM LAND
- STATE LAND
- PRIVATE LAND

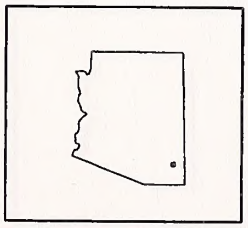
N

Scale

0 1500 3000

FEET

LOCATION MAP



USGS 7.5' QUADRANGLE: DOS CABEZAS, ARIZ.

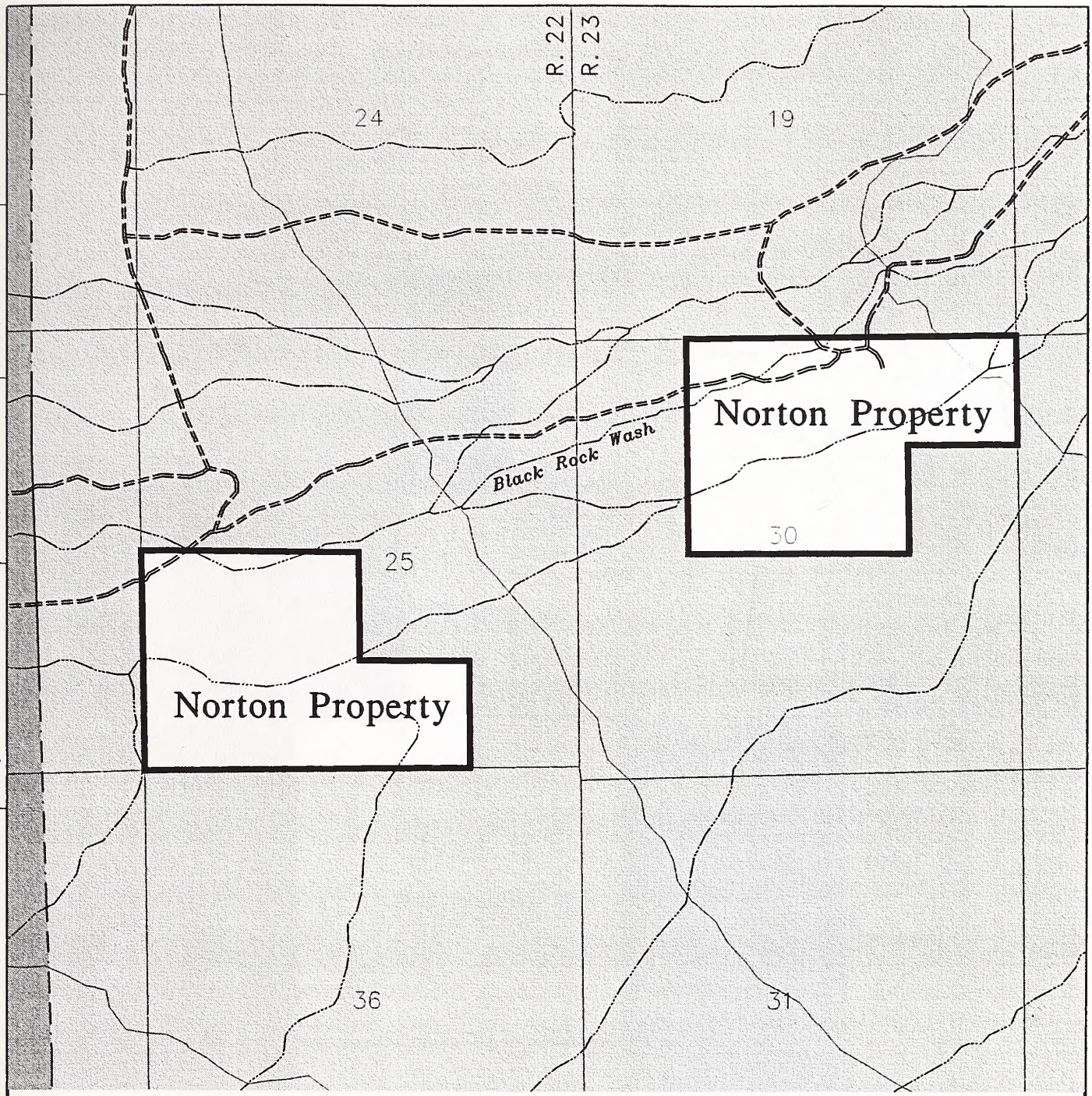
DOS POBRES/SAN JUAN PROJECT

Cochise County, Arizona T.14S.,R.28E.

FREELAND and BUTLER-BORG PROPERTIES OFFERED LANDS

FIGURE 2-32

Proj #: 1700-M-21 File: D:\Acad\Safford\OFF_LAND Drawing BUTL_FRE.DWG Drawn by: KAD/JLJ Chk'd by: TL Date: 8-16-97 Rev: 6-4-98



KEY

DIRT ROADS

EPHEMERAL DRAINAGES

PROPERTY BOUNDARY

BLM LAND

SAN CARLOS APACHE RESERVATION

PRIVATE LAND

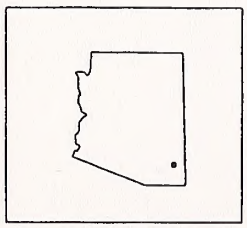
N

Scale

0 1000 2000

FEET

LOCATION MAP



USGS 7.5' QUADRANGLE: TELEGRAPH WASH, ARIZ.

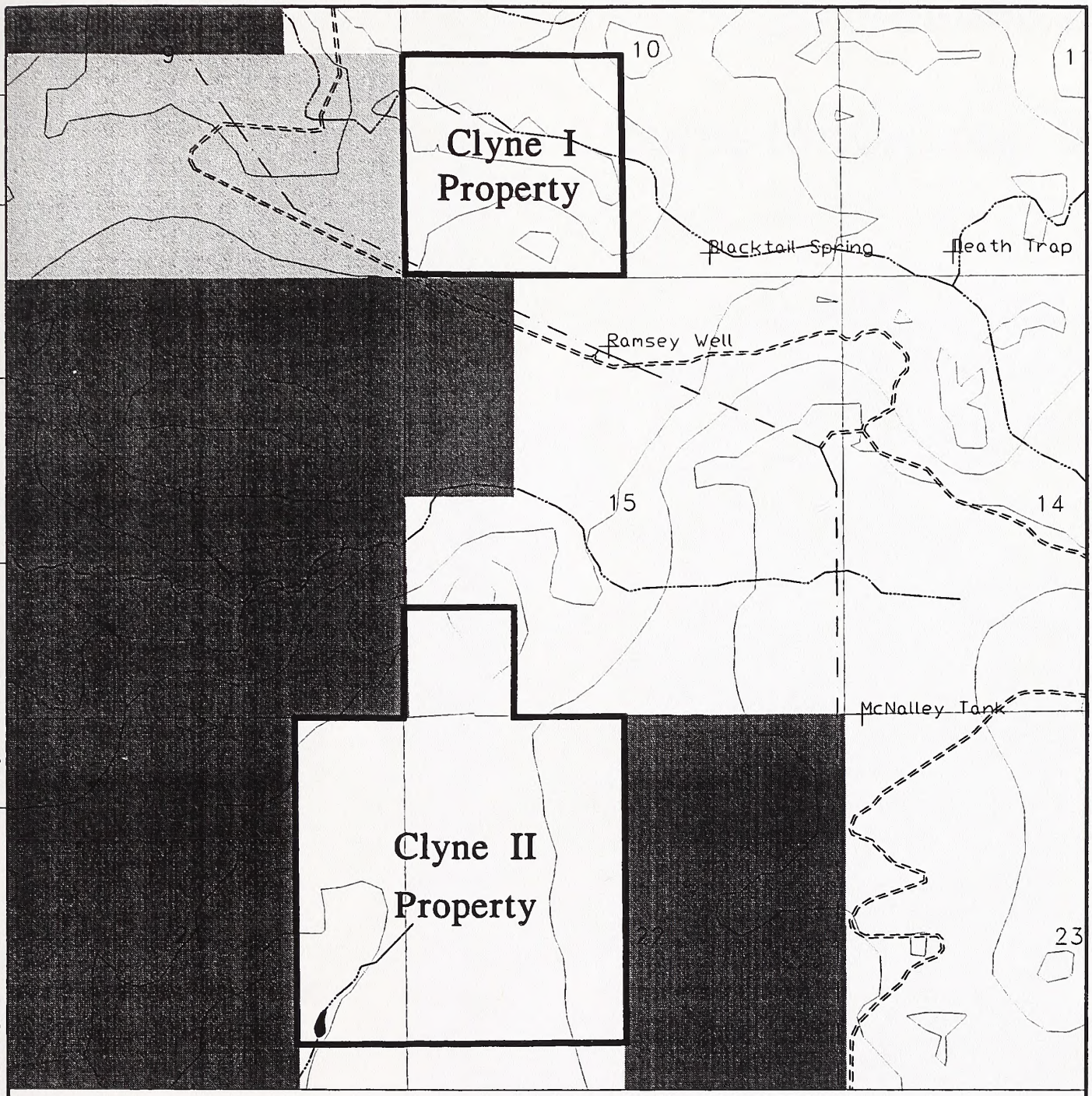
DOS POBRES/SAN JUAN PROJECT

Pima County, Arizona T.5S.,R.22E., T.5S.,R23E.

NORTON PROPERTY OFFERED LANDS

FIGURE 2-33

Proj #: 1700-H-21 | File: D:\Acad\Safford\DFF_LAND | Drawing NORTON.DWG | Drwn by: KAD/JLJ | Chk'd by: TL | Date: 8-16-97 | Rev: 4-29-98



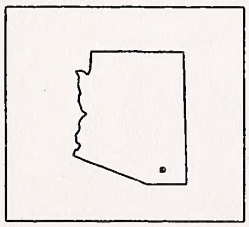
KEY

- DIRT ROADS
- EPHEMERAL DRAINAGES
- PROPERTY BOUNDARY
- BLM LAND
- STATE LAND
- PRIVATE LAND

N

Scale
0 1000 2000
FEET

LOCATION MAP



USGS 7.5' QUADRANGLE:
SPRING WATER CANYON, ARIZ.

DOS POBRES/SAN JUAN PROJECT

Pima County, Arizona T.19S.,R.19E.

CLYNE I and CLYNE II PROPERTIES
OFFERED LANDS

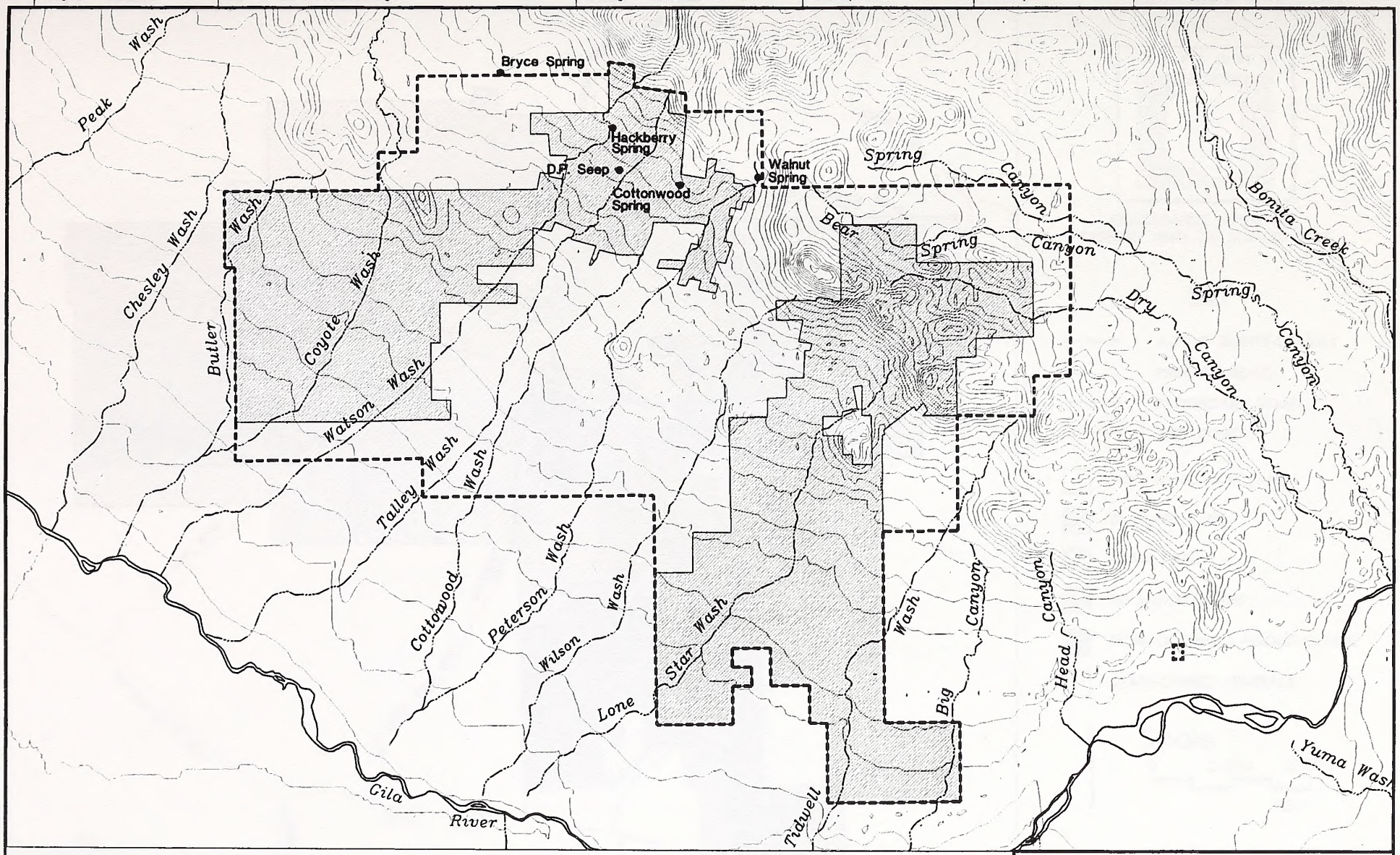
FIGURE 2-34

Proj. #: 1700-M-21 | File: D:\Acad\Safford\DFF_LAND | Drawing: CLYNE1_2 | Drawn by: KAD/JLJ | Chk'd by: TL | Date: 8-16-97 | Rev: 4-29-98

Volume 2

Figures for Chapter 3

Proj. #: 51-61700	File: D:\Acad\Safford\Drawings	Drawing: TOPOMAP.DWG	Drwn by: KAD	Chk'd by:	Date: 5-9-97	Rev: 4-29-98



Scale

0 1 2

MILES

CONTOUR INTERVAL 100 FEET

N

KEY

- PHELPS DODGE PRIVATE LAND
- PROJECT AREA BOUNDARY
- MAJOR DRAINAGE

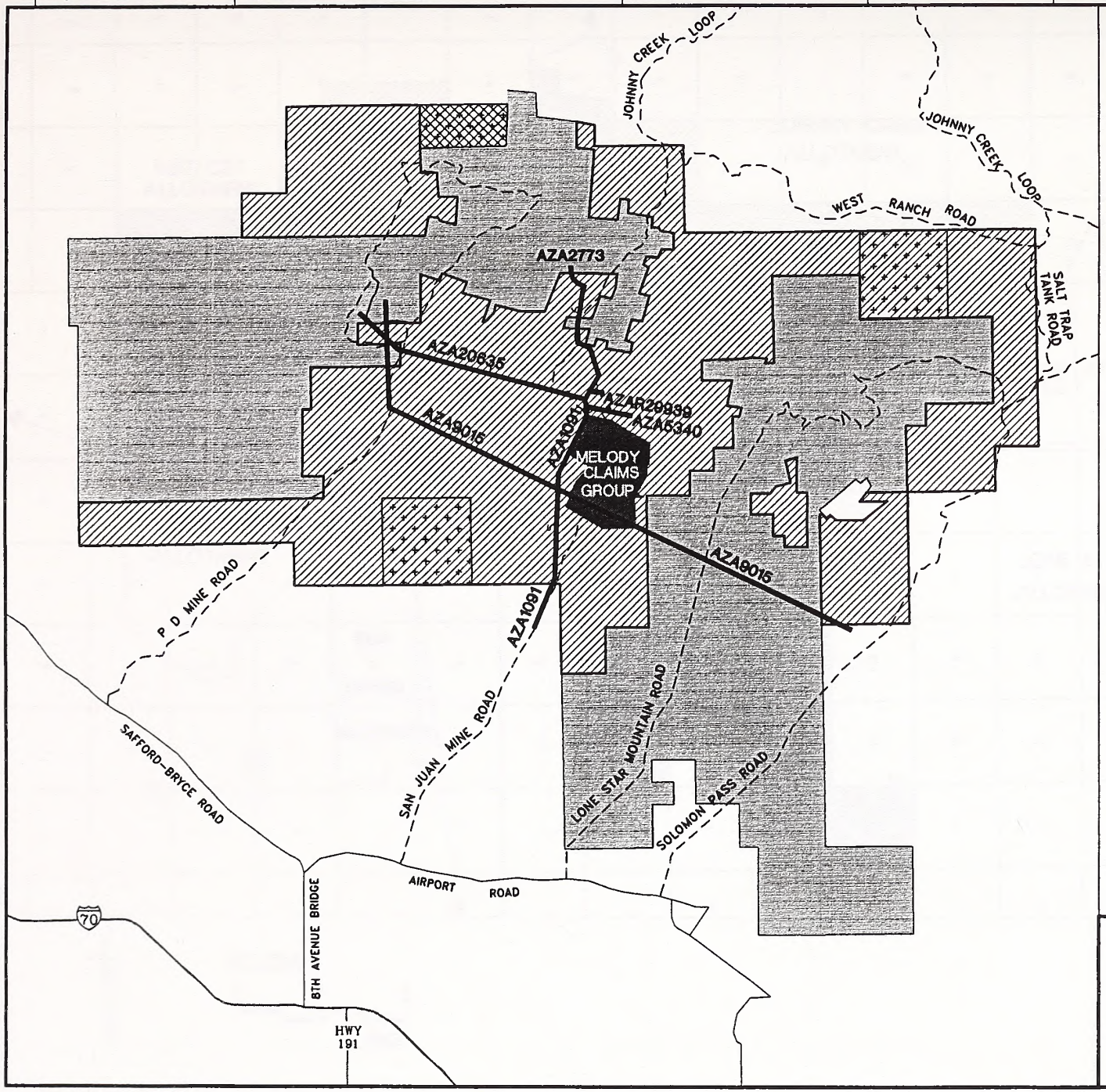
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

TOPOGRAPHY, SPRINGS AND MAJOR DRAINAGES IN THE PROJECT AREA

FIGURE 3-1

Proj. #: 51-61700 | File: D:\ACAD\Safford\Drawings | Drawing: RDW.DWG | Drwn by: KAD | Chk'd by: | Date: 12-13-96 | Rev: 4-29-98



QUADRANGLE LOCATION
SAFFORD USGS 7.5' QUADRANGLE

KEY

- ACTIVE RIGHTS-OF-WAY
- PRIMARY ROAD
- SECONDARY ROAD
- DIRT ROAD
- NON PD PRIVATE LAND
- SELECTED LAND
- STATE LAND
- PD PRIVATE LAND
- NON-PD OWNED MINING CLAIMS
- STATE-OWNED MINERALS

N

Scale
0 5,000 10,000
FEET

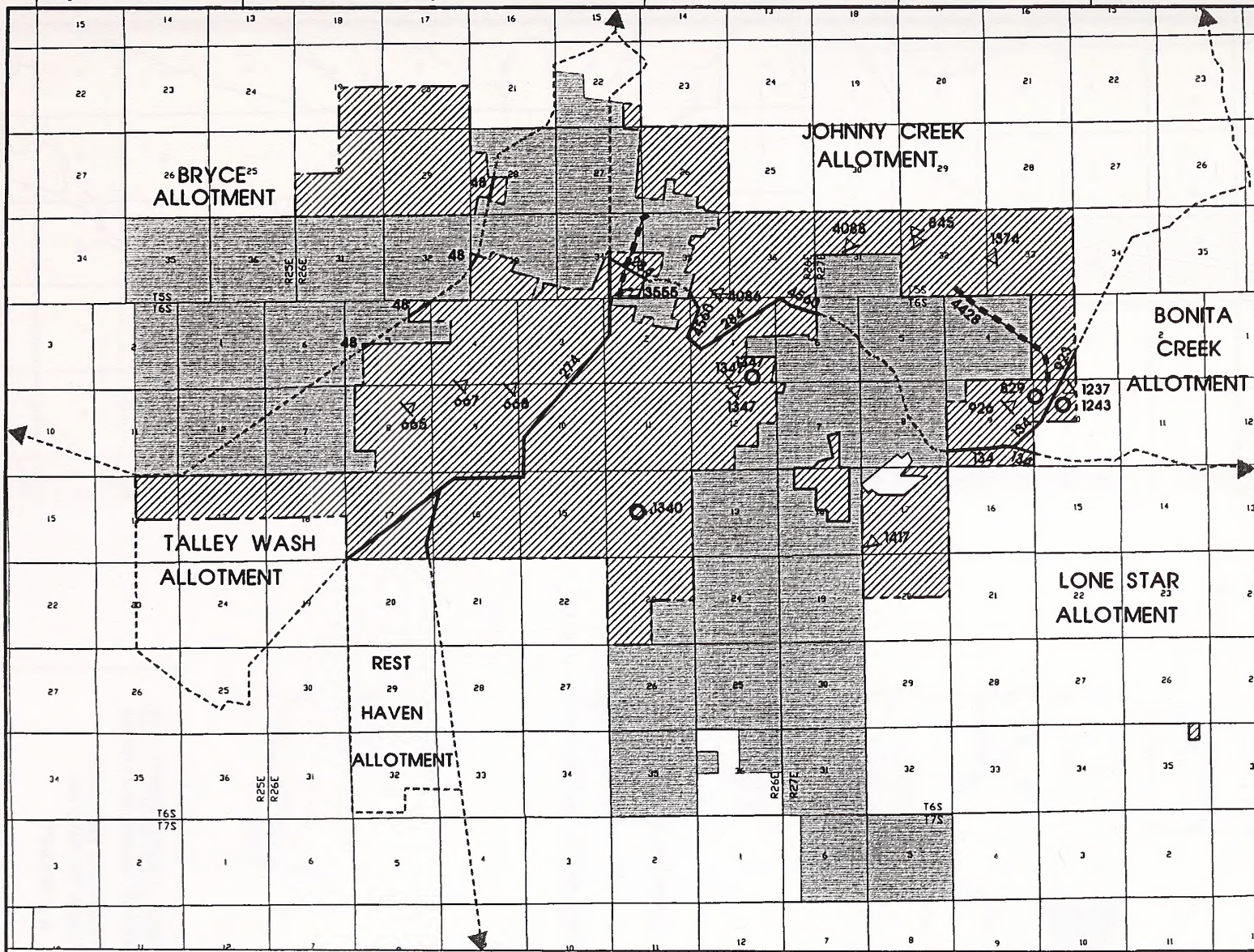
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

RIGHTS-OF-WAY AND
STATE-OWNED MINERAL ESTATE
IN THE PROJECT AREA

FIGURE 3-2

Proj. #: 51-61700 | File: D:\Acad\Safford\Drawings | Drawing: SAF_ALT.DWG | Drwn by: KAD | Chk'd by: | Date: 10/30/97 | Rev: 4-29-98



QUADRANGLE LOCATION
SAFFORD USGS 7.5' QUADRANGLE

KEY

LAND OWNERSHIP

- PHELPS DODGE
- SELECTED LAND
- PRIVATE LAND

RANGE IMPROVEMENTS

- 1243 CORRAL
- 665 DIRT TANK
- GRAZING ALLOTMENT BOUNDARY
- FENCE ALONG ALLOTMENT BOUNDARY
- PIPELINE

N

Scale

0 1 2

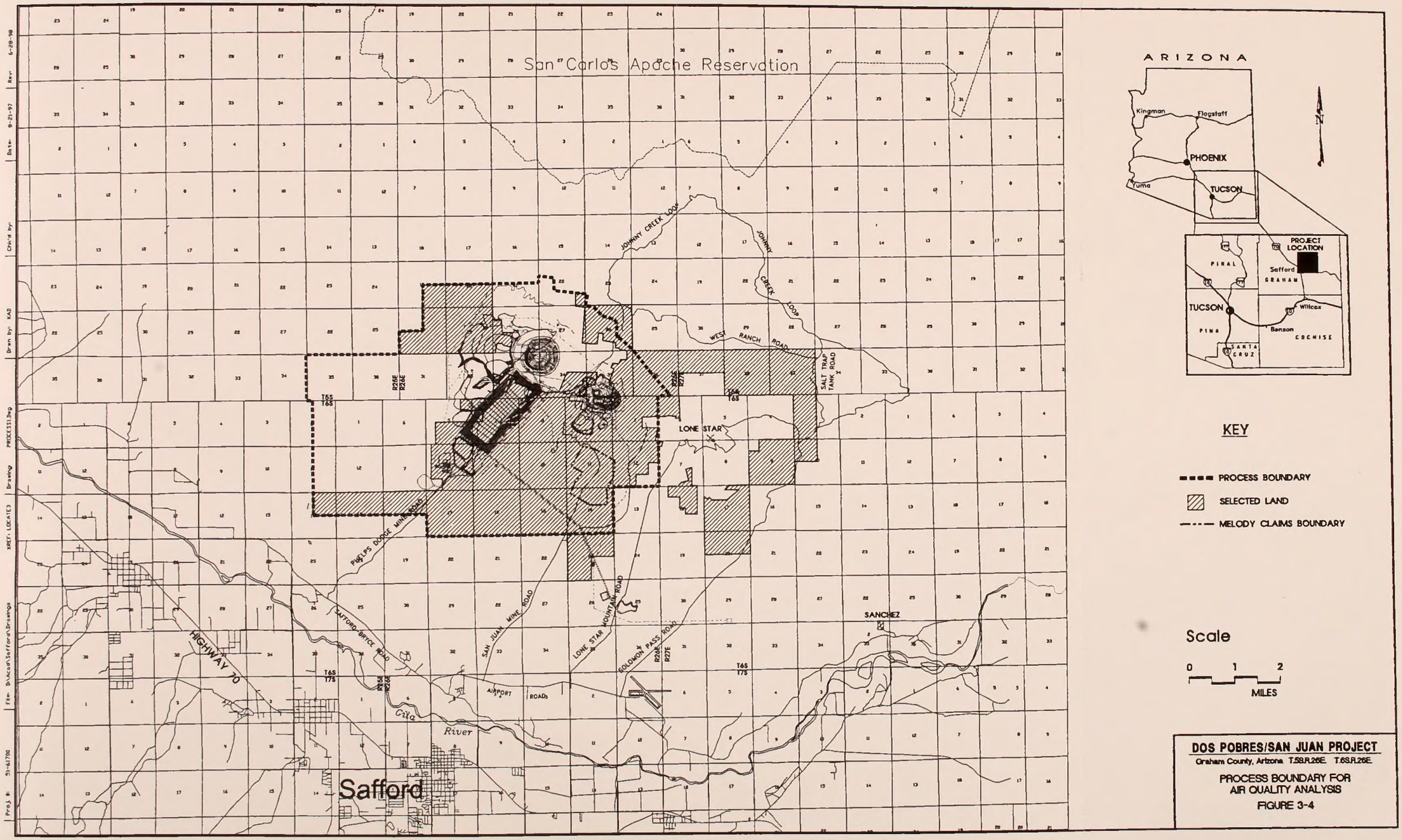
MILES

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

BLM GRAZING ALLOTMENTS AND RANGE IMPROVEMENTS WITHIN THE PROJECT AREA

FIGURE 3-3

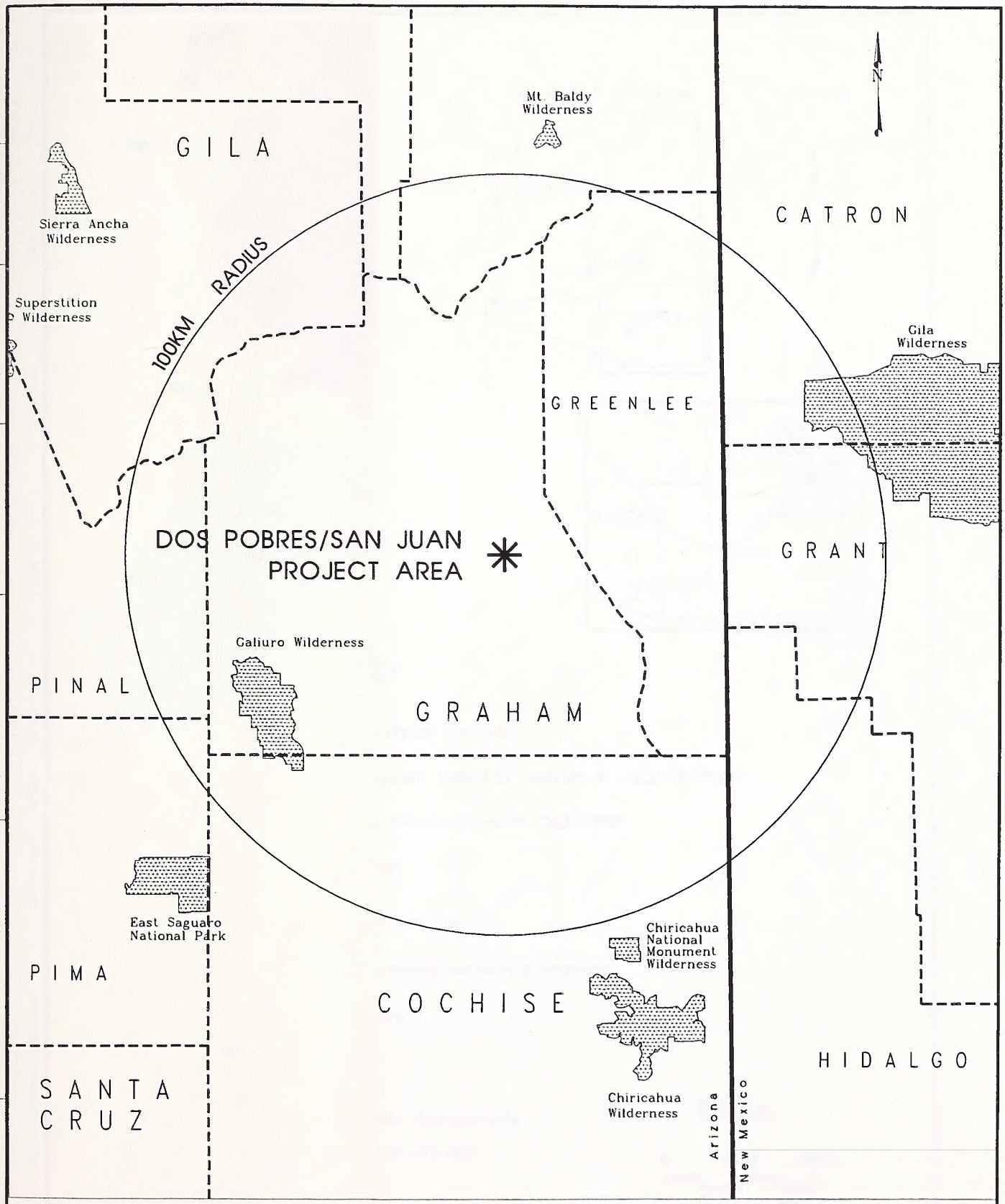


DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

PROCESS BOUNDARY FOR AIR QUALITY ANALYSIS

FIGURE 3-4



KEY

Scale

0 25

MILES

CLASS 1 AREA

CENTER OF 100KM RADIUS

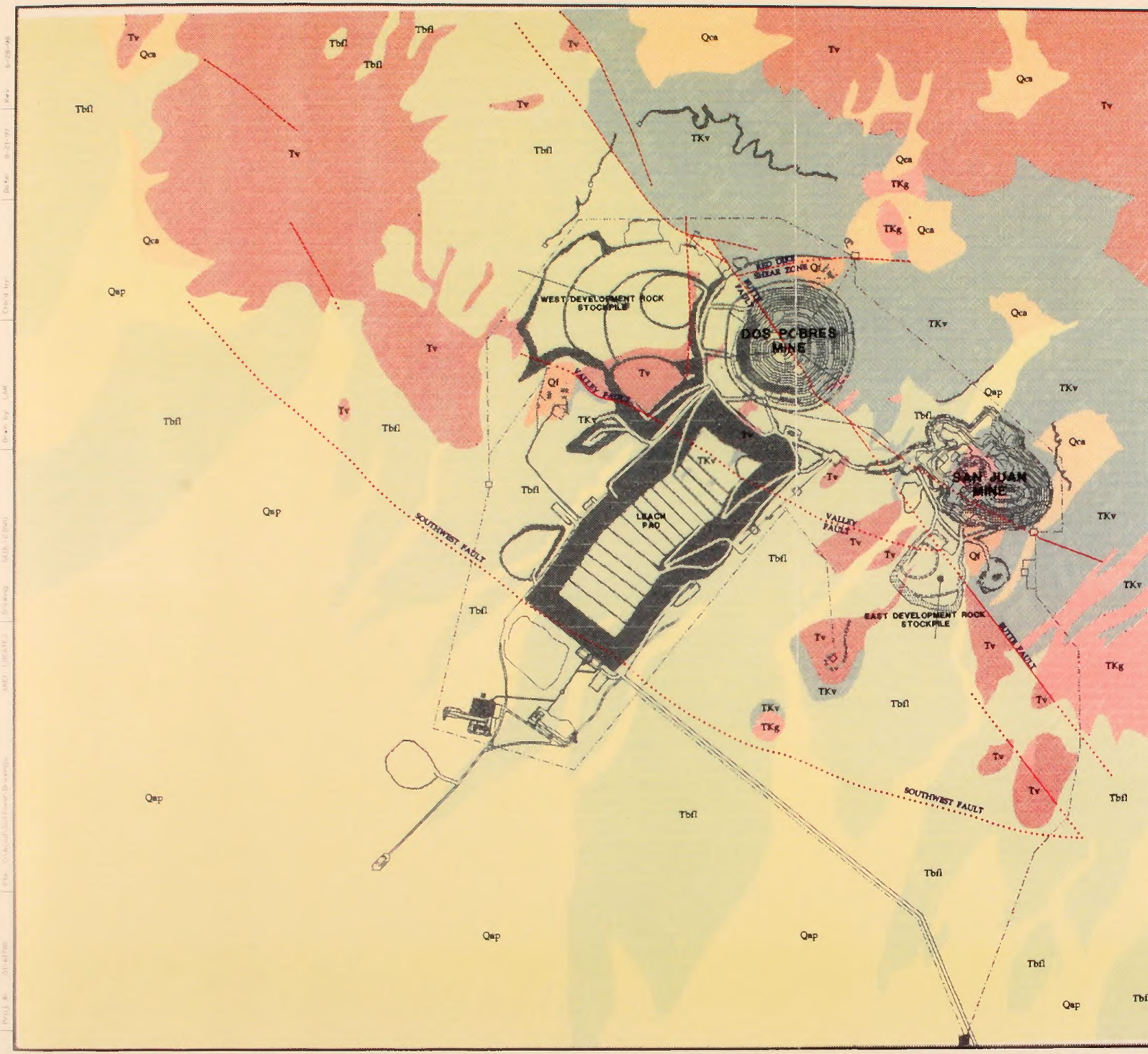
DOS POBRES/SAN JUAN PROJECT

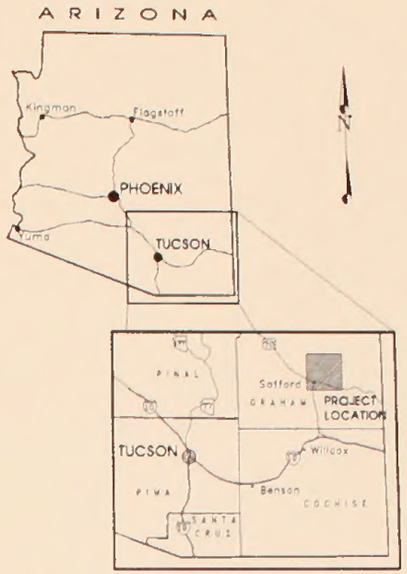
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

LOCATION OF MANDATORY CLASS 1 AREAS

FIGURE 3-5

Proj # 51-61700 | File D:\Acad\Safford\Drawings | Drawing AIR.DWG | Drawn by KAD | Chk'd by | Date 11-19-96 | Rev. 4-29-98





KEY

- **Qf** Fill Material, Locally Derived
- **Qap** Pediment Alluvium, Including Alluvium in Large Washes
- **Qca** Colluvial and Alluvial Deposits, Undivided
- **Tbfl** Lower Basin Fill
- **Tv** Gila Mountain Volcanics
- **TKg** Quartz Monzonite-Granodiorite Porphyry
- **TKv** Safford Volcanics

Normal Fault
Dashed where Approximate
Dotted where Inferred

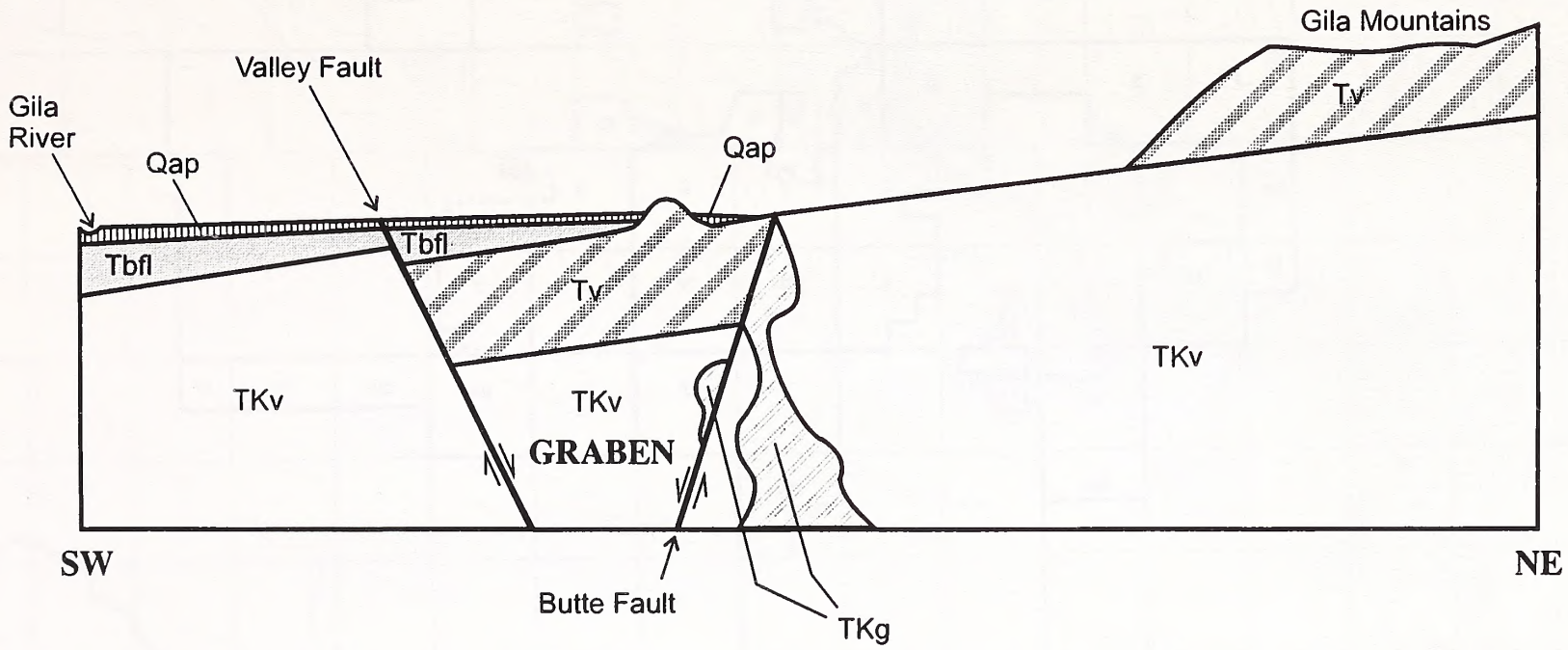
Scale

0 2000 4000
FEET

DOS POBRES/SAN JUAN PROJECT
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.
GEOLOGIC MAP

FIGURE 3-6

Proj. #51-61700	File: GEOSECT.CDR	Drawing:	Drwn by: HDG	Chk'd by: KAD	Date: 10/30/97	Rev:



KEY:

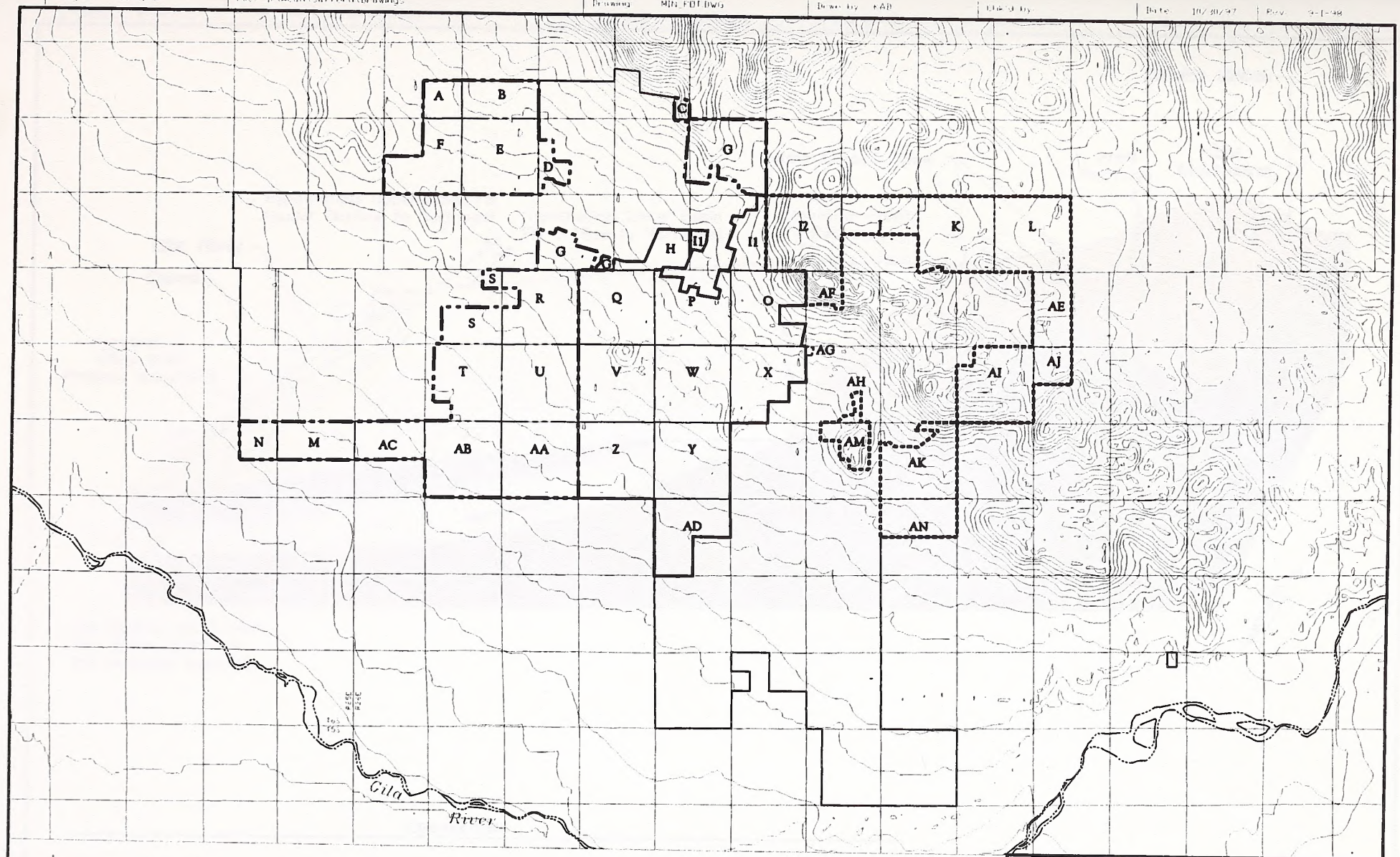
Qap	Recent Alluvium (Pediment Alluvium)
Tbfl	Lower Basin Fill
TKg	Quartz Monzonite-Granodiorite Porphyry
TKv	Safford Volcanics
Tv	Gila Mountain Volcanics

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

GEOLOGICAL CROSS SECTION (SCHEMATIC) THROUGH PROJECT AREA

FIGURE 3-7



Scale

0 1 2

MILES

CONTOUR INTERVAL 100 FEET

KEY

DOS POBRES MINERAL POTENTIAL BLOCK

SAN JUAN MINERAL POTENTIAL BLOCK

LONESTAR MINERAL POTENTIAL BLOCK

PROJECT AREA BOUNDARY

Source: Wahl 1997a

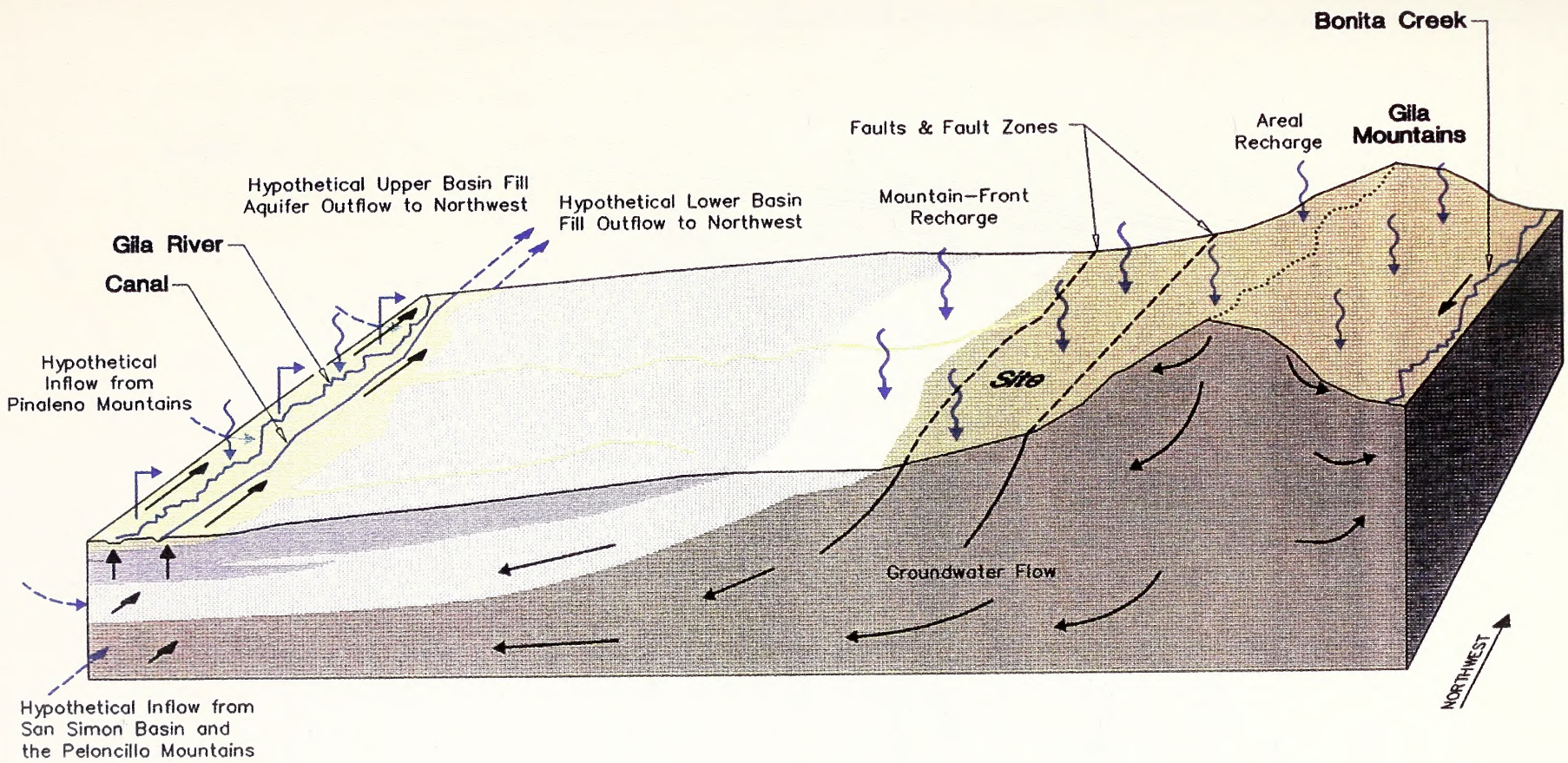
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

MINERAL POTENTIAL BLOCKS OF SELECTED LANDS

FIGURE 3-8

Proj. #: 51-61700 | File: D:\Acad\Safford\Drawings | Drawing: CONMODEL.DWG | Drwn by: KAD | Chk'd by: | Date: 10-27-97 | Rev: 4-23-98



EXPLANATION

- Areal and Mountain–Front Recharge
- Irrigation Pumping
- Metavolcanics and Gila Mountain Volcanics
- Recent Alluvium
- Lakebeds of the Lower Basin Fill
- Lower Basin Fill

Source: Dames & Moore 1997a

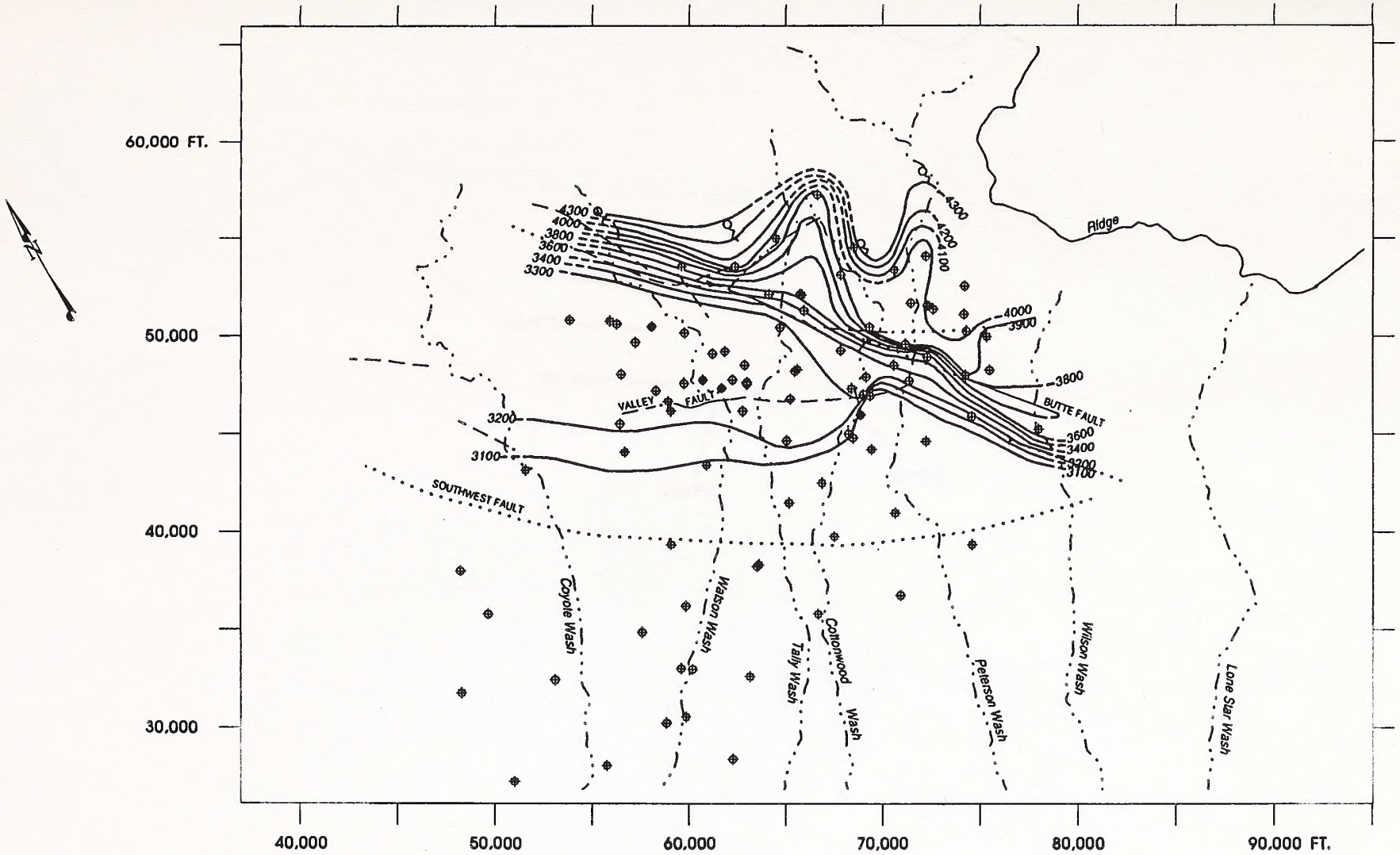
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona

CONCEPTUAL MODEL OF GROUNDWATER FLOW

FIGURE 3-9

Proj. #: 51-61700	File: D:\ACAD\SAFFORD\DRAWINGS	Drawing: WATERTAB2.DWG	Drwn by: KAD	Chk'd by:	Date: 5-14-97	Rev: 4-23-98



NORMAL FAULT, DASHED WHERE APPROXIMATE, DOTTED WHERE INFERRED

3400 WATER TABLE ELEVATION (FT. AMSL.), DASHED WHERE APPROXIMATE, DOTTED WHERE INFERRED

MONITORING WELL

GROUND-WATER EXTRACTION WELL, PIEZOMETER

PUMPING WELL)

SPRING

(Source: Dames and Moore)

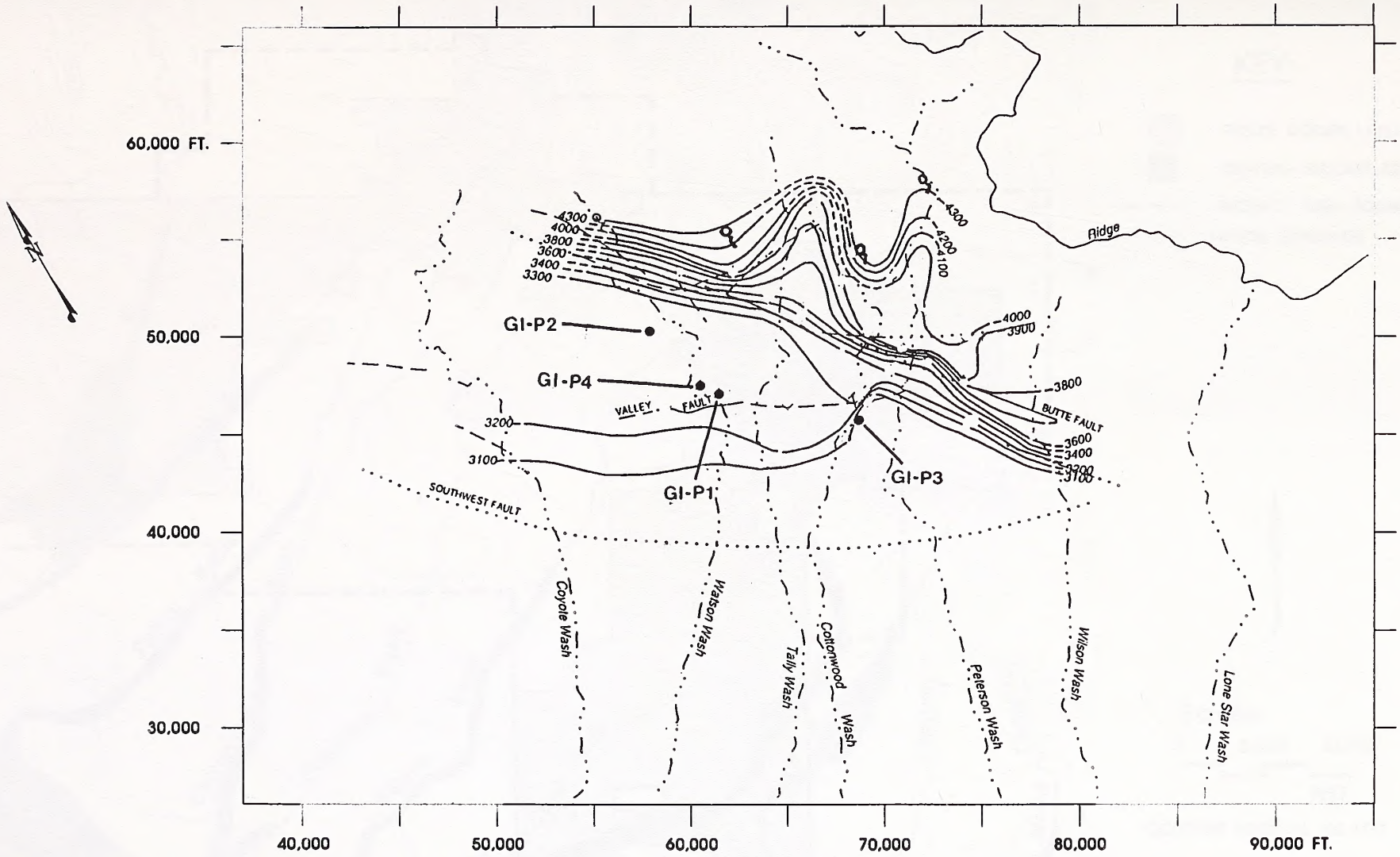
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

LOCATIONS OF WELLS IN THE PROJECT AREA AND OBSERVED WATER TABLE

FIGURE 3-10

Proj. #: 51-61700	File: D:\ACAD\SAFFORD\DRAWINGS	Drawing: WATERTAB.DWG	Drwn by: KAD	Chk'd by:	Date: 5-14-97	Rev: 4-23-98



KEY

NORMAL FAULT, DASHED WHERE APPROXIMATE, DOTTED WHERE INFERRED

3400 WATER TABLE ELEVATION (FT. AMSL.), DASHED WHERE APPROXIMATE, DOTTED WHERE INFERRED

PILOT WELL

SPRING

(Source: Dames and Moore)

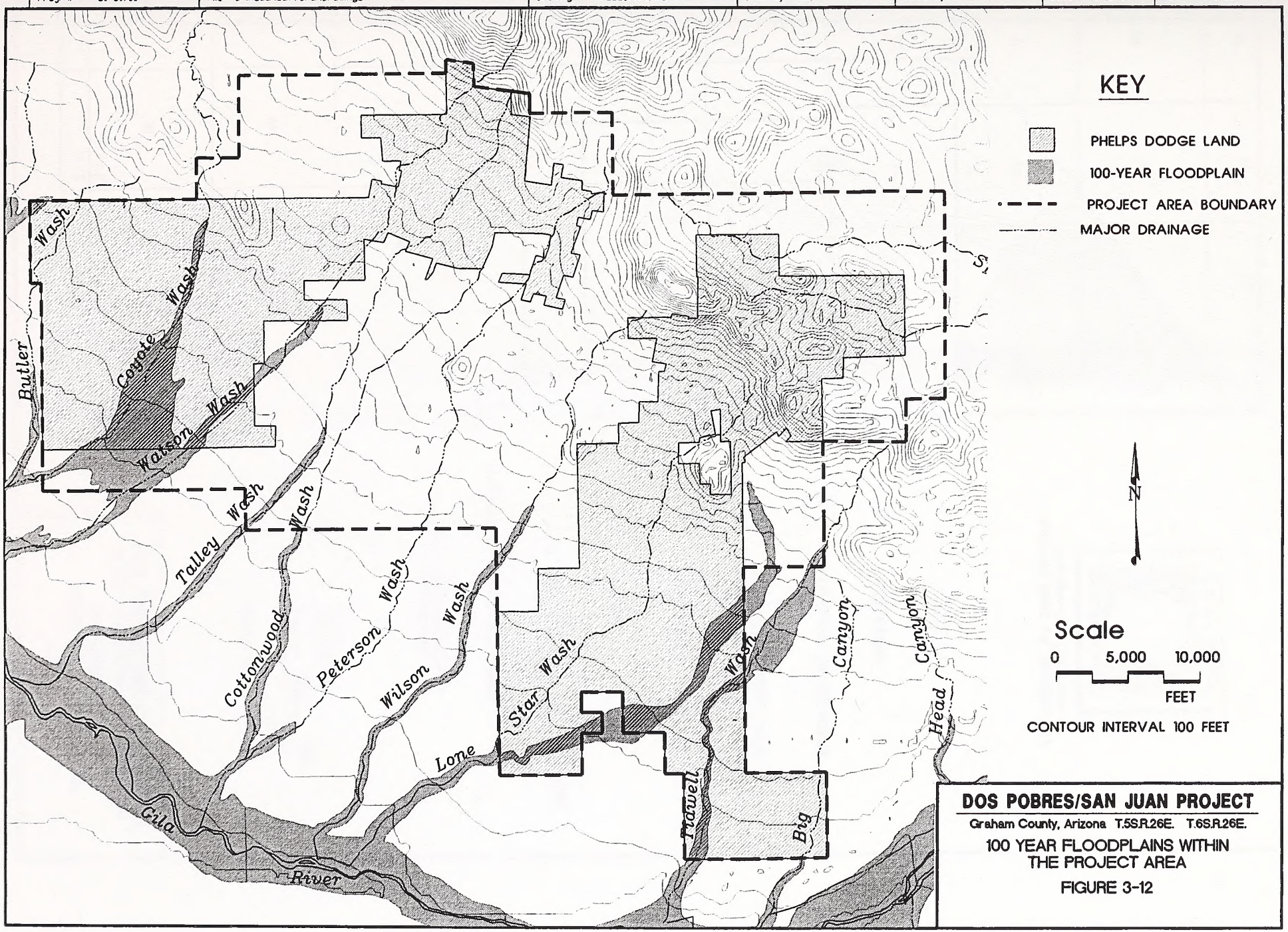
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

LOCATION OF PILOT-WELLS AND OBSERVED WATER TABLE

FIGURE 3-11

Proj. #: 51-61700	File: D:\Acad\Safford\Drawings	Drawing: FLOODMAP.DWG	Drwn by: KAD	Chk'd by:	Date: 5-13-97	Rev: 9-1-98

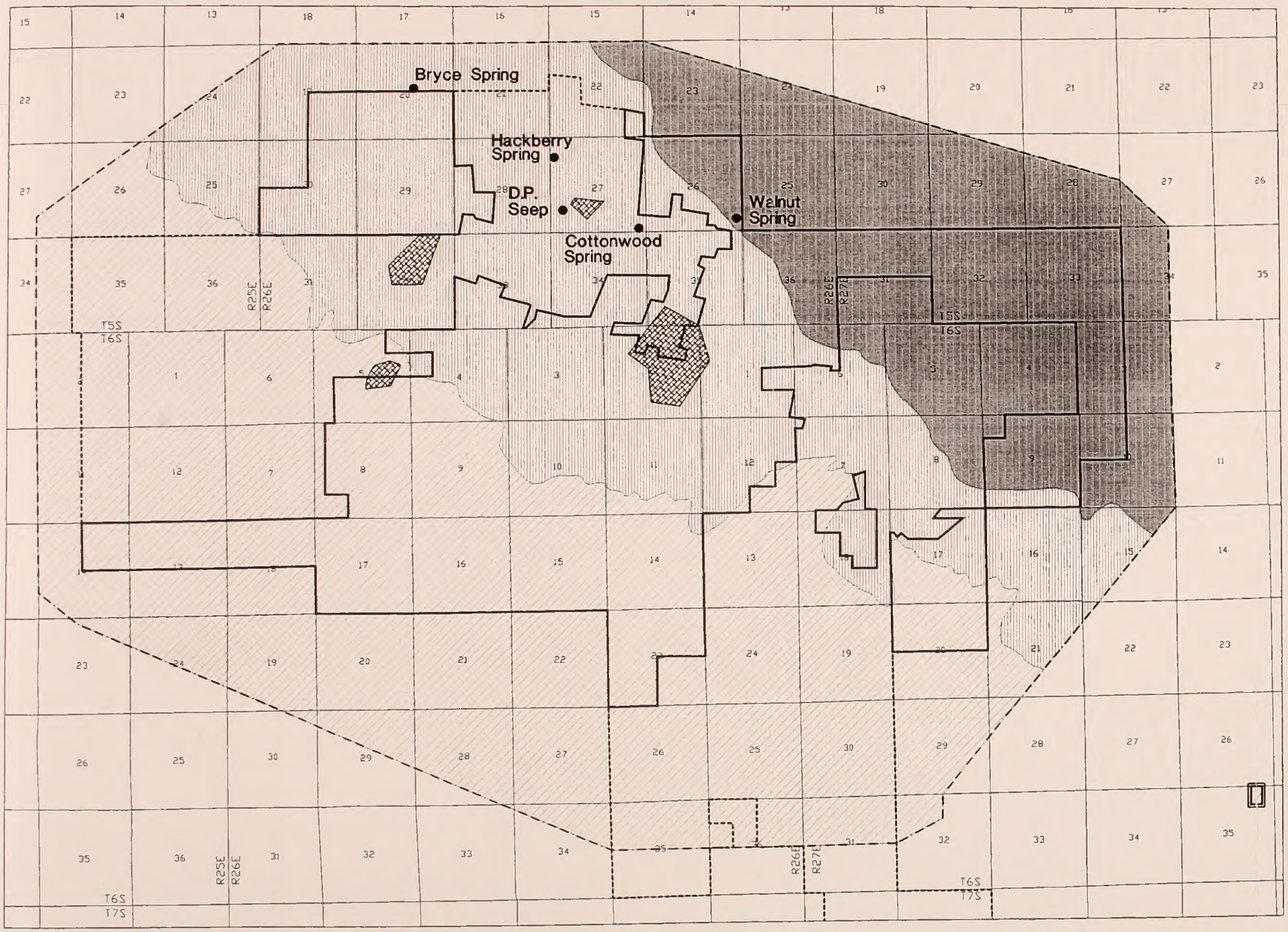


DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

100 YEAR FLOODPLAINS WITHIN THE PROJECT AREA

FIGURE 3-12



QUADRANGLE LOCATION
SAFFORD USGS 7.5' QUADRANGLE

KEY

- SPRING/SEEP
- SONORAN DESERTSCRUB
- SONORAN DESERTSCRUB/ SEMIDESERT GRASSLAND ECOTONE
- SEMIDESERT GRASSLAND
- DISTURBED
- BASELINE BIOLOGICAL REPORT STUDY AREA BOUNDARY
- SELECTED LANDS
- PROJECT AREA BOUNDARY

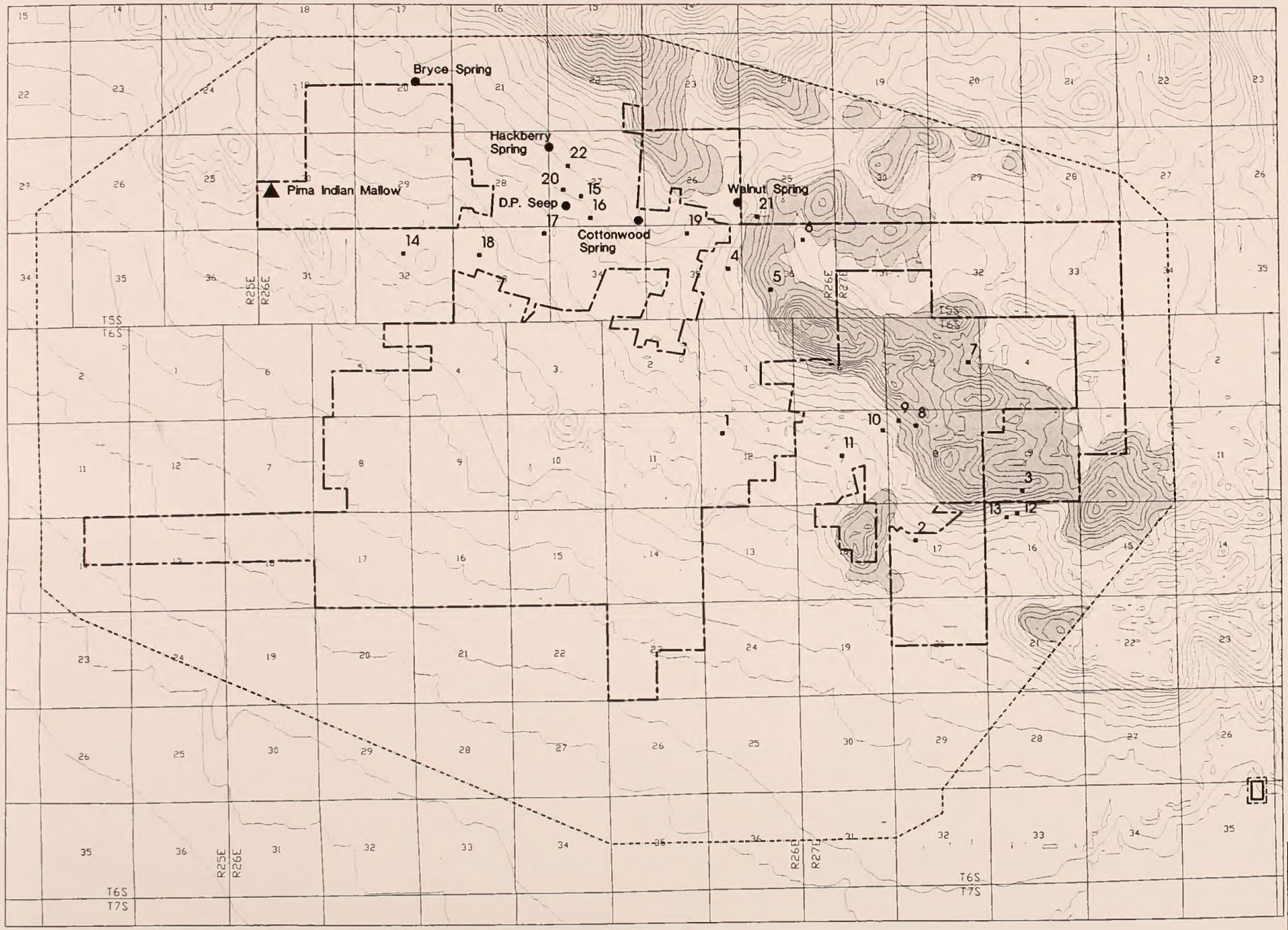
N

Scale
0 3000 6000
FEET
CONTOUR INTERVAL 100 FEET

DOS POBRES/SAN JUAN PROJECT
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

BIOTIC COMMUNITIES
WITHIN THE PROJECT AREA

FIGURE 3-13



QUADRANGLE LOCATION
SAFFORD USGS 7.5' QUADRANGLE

KEY

- CAVE, MINE ADIT
- SPRING/SEEP
- BASELINE BIOLOGICAL REPORT STUDY AREA BOUNDARY
- SELECTED LANDS
- POTENTIALLY SUITABLE HABITAT FOR THE UNDETERMINED ECHINOCEREUS CACTUS

N

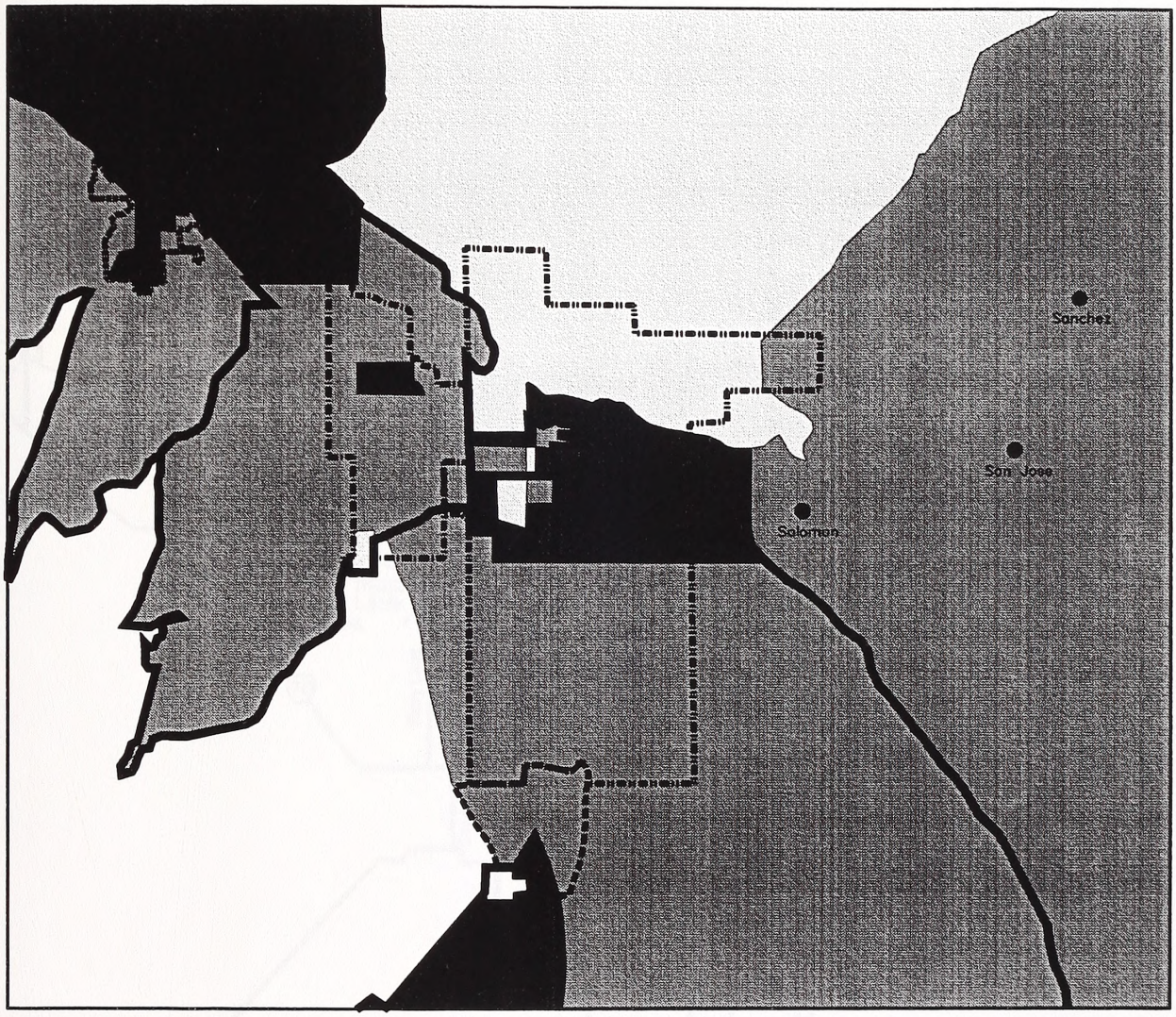
Scale
0 3000 6000
FEET
CONTOUR INTERVAL 100 FEET

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

MINE ADITS AND CAVES AND POTENTIALLY SUITABLE HABITAT FOR THE UNDETERMINED ECHINOCEREUS CACTUS AND PIMA INDIAN-MALLOW LOCATION IN THE PROJECT AREA.

FIGURE 3-14



KEY

- City
- Pima
- Safford
- Swift Trail Jct.
- Thatcher
- Census Tracts

- None
- 1 - 30%
- 30 - 40%
- > 40%

N

Scale

0 1 2

MILES

DOS POBRES/SAN JUAN PROJECT

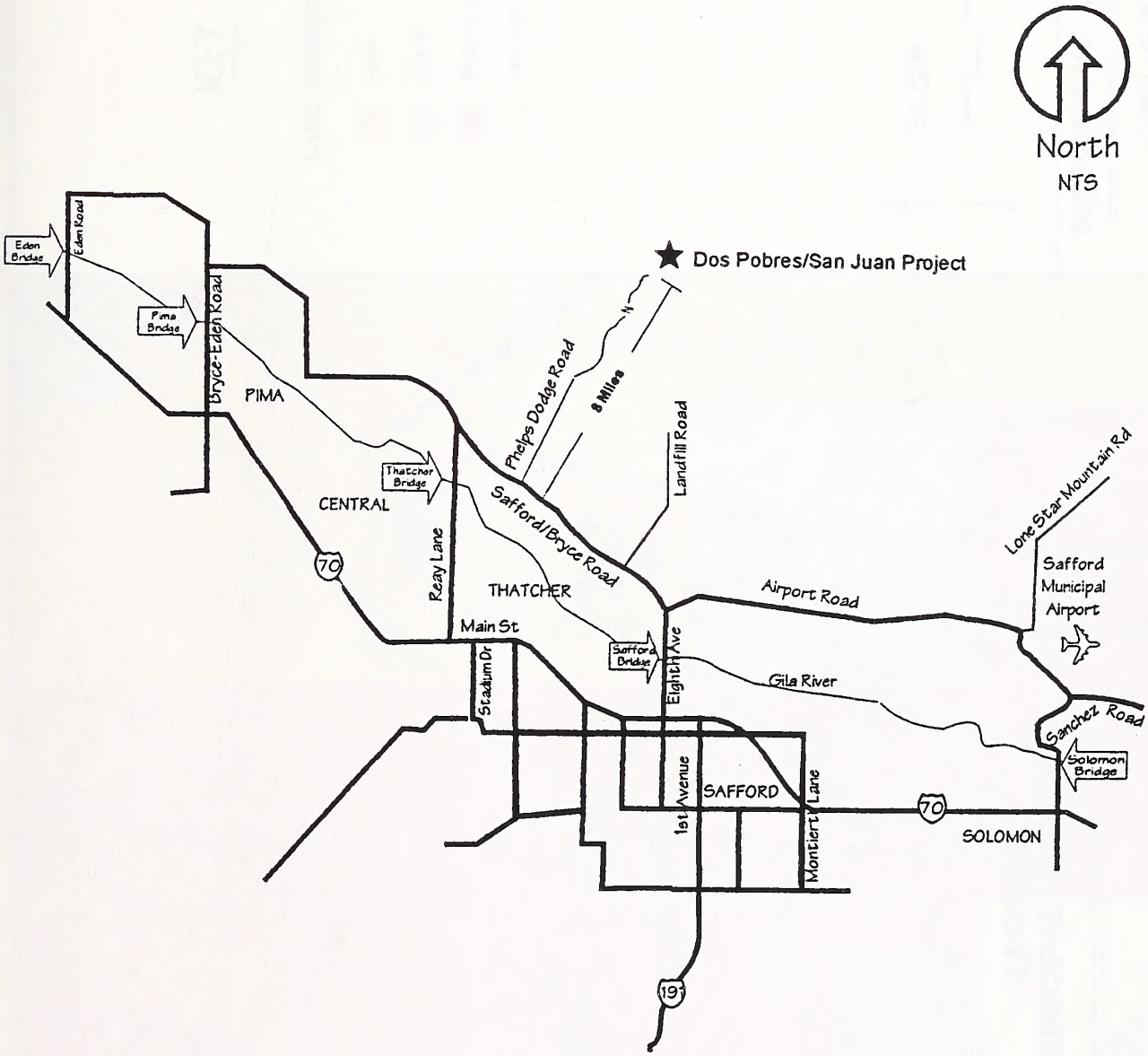
Graham County, Arizona

PERCENT OF HOUSEHOLDS WITH ANNUAL INCOME LESS THAN $15,000 BY BLOCK GROUP

FIGURE 3-15

Source: ESI 1997

Proj. #: 51-61700 | File: D:\ACAD\SAFFORD\DRAWINGS | Drawing: PERCENT.DWG | Drawn by: KAD | Chk'd by: | Date: 11-19-96 | Rev: 4-29-98



DOS POBRES/SAN JUAN PROJECT

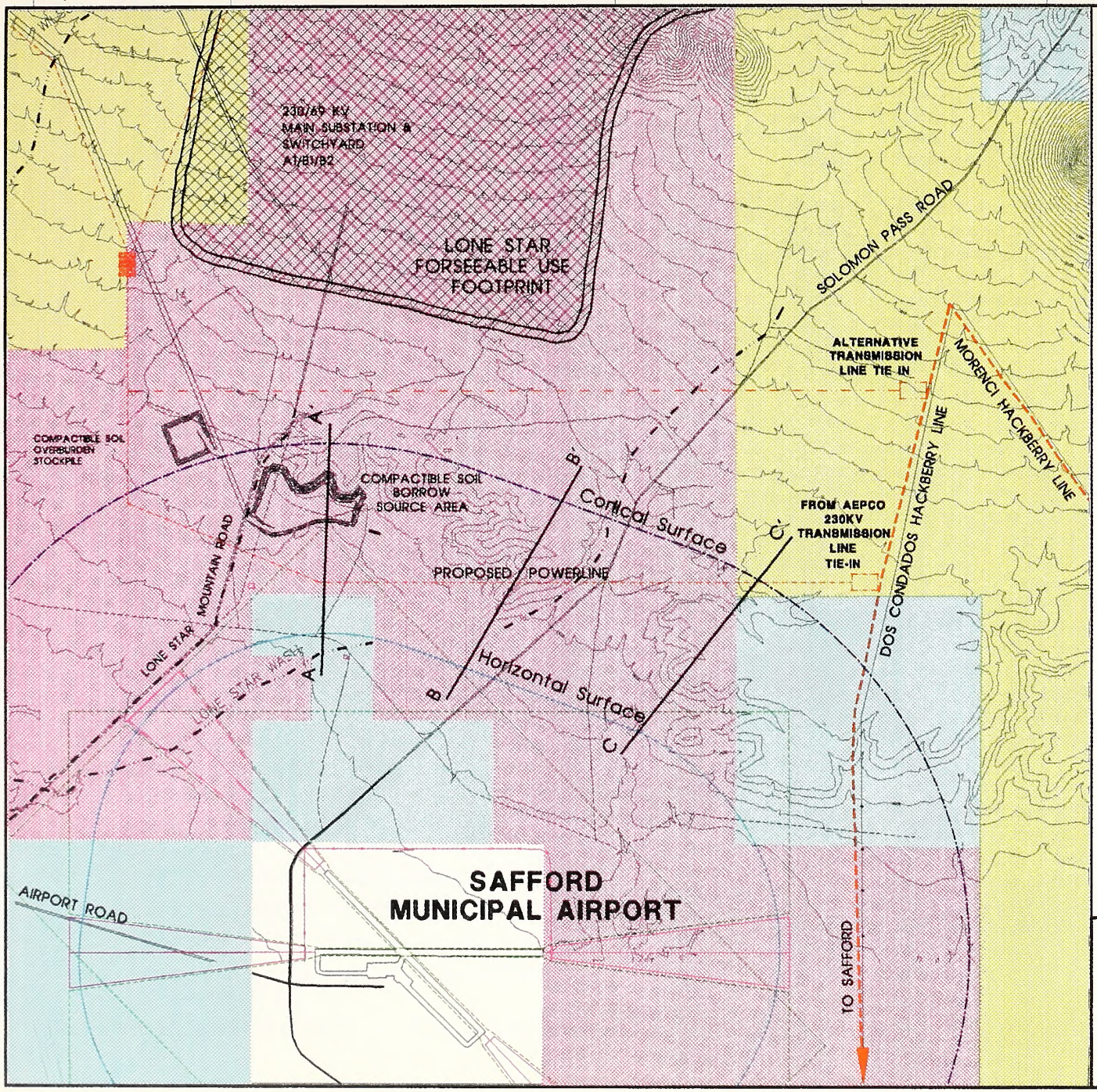
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

TRANSPORTATION STUDY AREA

FIGURE 3-16

Proj. #: 51-61700 | File: D:\Acad\Safford\Drawings | Drawing: TRANS.DWG | Drawn by: KAD | Chk'd by: | Date: 5-16-97 | Rev:

Proj. #: 51-61700	File: D:\Acad\Safford\Newmpo	Drawing: Airport3	Drwn by: KAD	Chk'd by:	Date: 2-5-97	Rev: 4-23-98



KEY

LAND OWNERSHIP

- BLM
- STATE
- PHELPS DODGE
- PRIVATE

N

Scale

0 3500

Feet

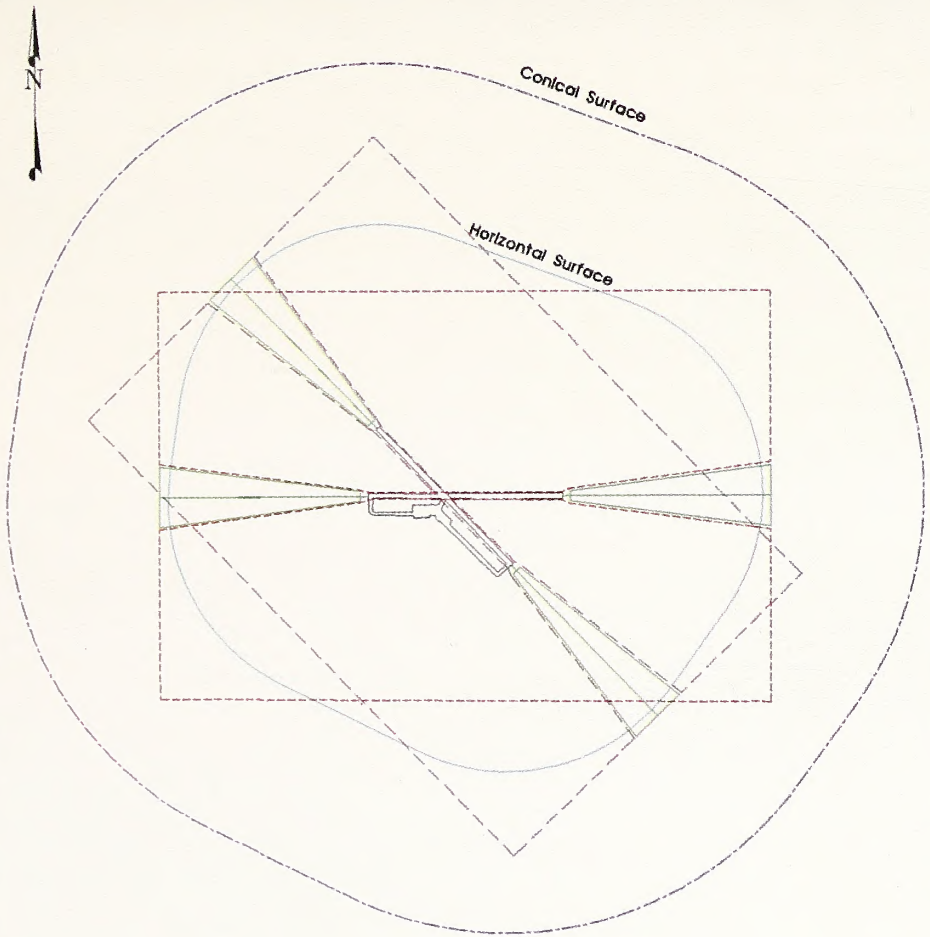
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

POWERLINE ROUTING
CONTSTRAINTS ANALYSIS.

FIGURE 3-17

Proj. #: 51-61700	File: C:\Acad\Safford\Newmpo	Drawing: AIR.DWG	Drwn by: KAD	Chk'd by:	Date: 1-29-97	Rev: 4-23-98



KEY

- EAST-WEST RUNWAY TRANSITION ZONE
- NW-SE RUNWAY TRANSITION ZONE
- APPROACH SURFACE - SLOPE 20:1 AT 5000' HORIZ. DIST.
- HORIZONTAL SURFACE - 150' ABOVE AIRPORT ELEVATION AT 5000' HORIZ. DIST.
- CONICAL SURFACE - SLOPE 20:1 AT 4000' HORIZ. DIST.

Primary Surface. An airport's primary surface is its longitudinally centered runway in which its elevation is the same for any point along its centered line. The minimum primary surface width allowable for visual runways, such as Safford's, is 250 feet. For paved runways the primary surface extends 200 feet from the end of the paved surface. For the Safford Airport the primary surface elevation ranges from 3157 feet msl to 3176 feet msl.

Horizontal Surface. The imaginary plane existing 150 feet above the airstrip elevation. For visual runways , the perimeter of this surface is a series of arcs with minimum radius of 5000 feet from the center of each end of the runways primary surface, connected by the tangent to those arcs. For the Safford Airport the horizontal surface elevation ranges from 3307 feet to 3326 feet msl, which reflects the slope of the runway.

Conical Surface. The imaginary surface which extends outward and upward from the edge of the horizontal surface at a 20H:1V slope for a horizontal distance of 4,000 feet. The conical surface at the Safford Airport was estimated using the lowest known runway elevation (3157 feet msl) and the highest known runway elevation (3176 feet msl). Proportioning was used to calculate points in between. The conical surface elevation on the north side of the Safford Airport ranges from 3307 feet msl to 3326 feet msl at the edge of the Horizontal Surface to 3507 feet msl to 3526 msl of the outer edge of the Conical Surface.

Approach Surface. An imaginary plane centered on the runway centerline that extends upwards and outwards for a horizontal distance of 5,000 feet and at a slope of 20H:1V from the end of the primary surface. The Safford Airport approach surface's inner edge is the width of its primary surface, 250 feet at Safford Airport, and expands uniformly to a width of 1,500 feet for non-utility, visual runways. The approach surface is 5,000 feet long. The approach surface starts at the elevation of the primary surface and extends to an elevation up to 3,426 ft msl.

Transitional Surface. The imaginary plane that extends outward and upward at a right angle from the runway's centerline with a slope of 7H:1V from the sides of the primary surface and the sides of the approach surfaces. The Transitional Surface projects to a horizontal distance of 5,000 feet from a right angle of the runway centerline and the edge of the approach surface. The minimal transitional surface is 3,325 ft msl and the maximum elevation is 3,890 ft msl.

Scale 0 1000 2000 FEET

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

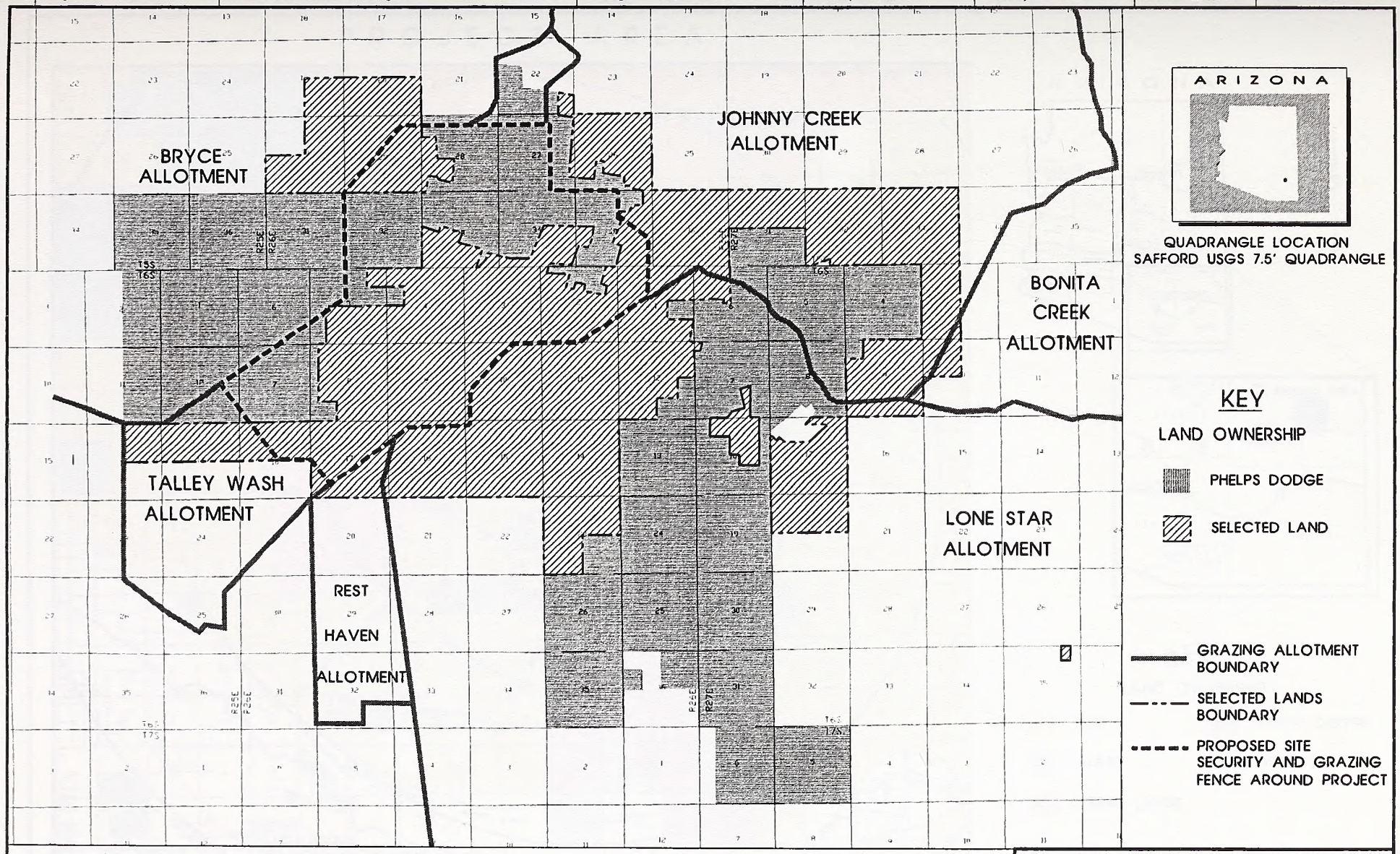
CIVIL AIRPORT IMAGINARY SURFACE DEFINITIONS FOR THE SAFFORD AIRPORT

FIGURE 3-18

Volume 2

Figures for Chapter 4

Proj. #: 51-61700 | File: D:\Acad\Safford\Drawings | Drawing: SAF_FENC.DWG | Drwn by: KAD/JLJ | Chk'd by: | Date: 10/30/97 | Rev: 9-1-98



DOS POBRES/SAN JUAN PROJECT

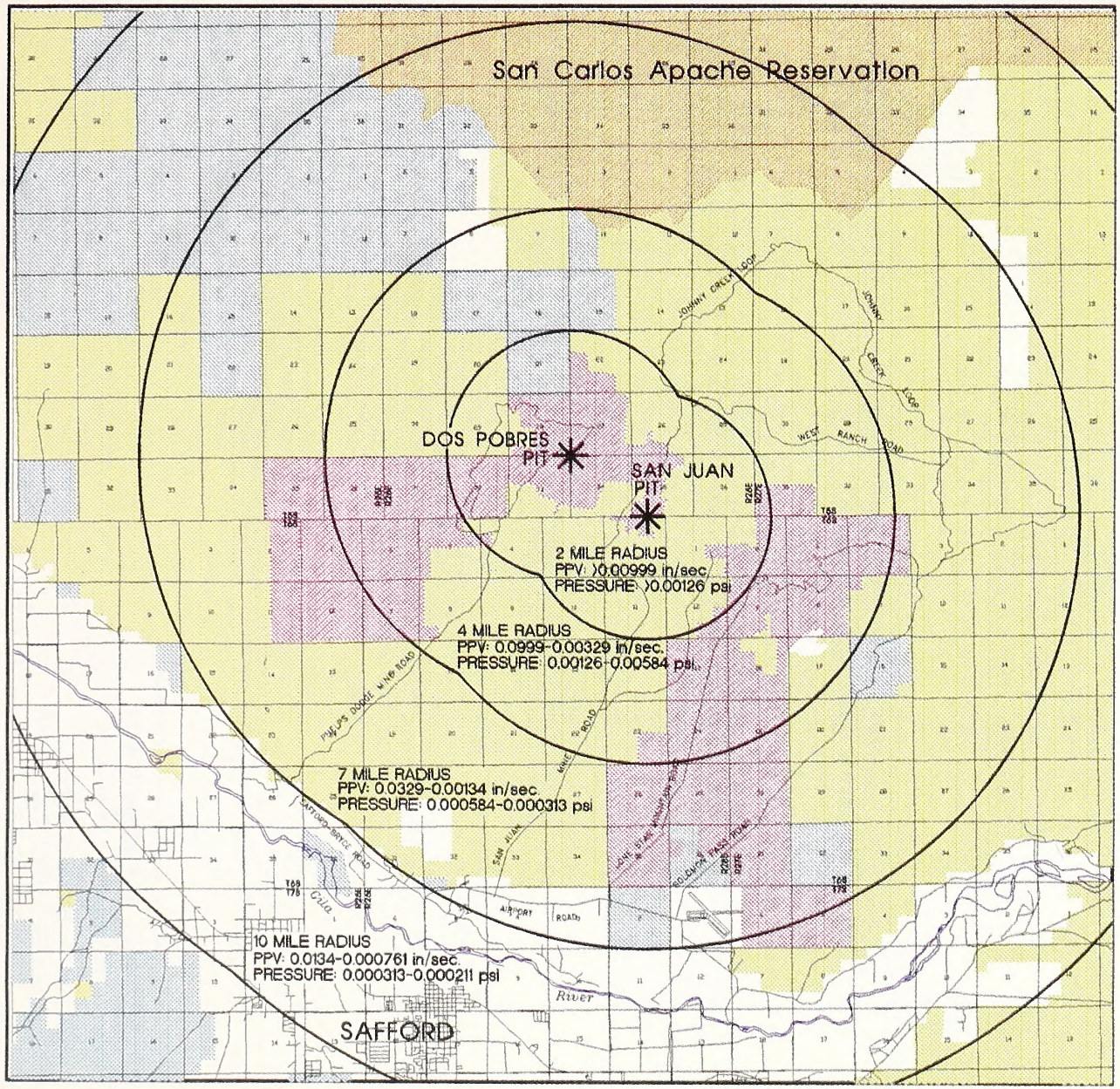
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

PORTIONS OF ALLOTMENTS TO BE FENCED OFF AND UNAVAILABLE FOR GRAZING

FIGURE 4-1

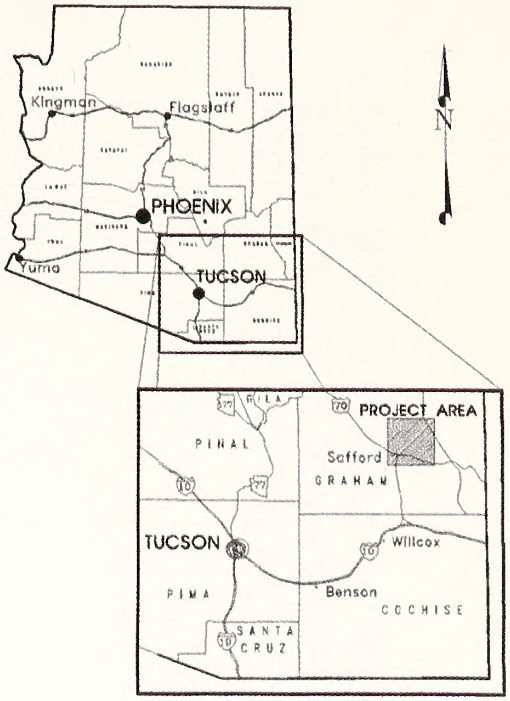
Proj. #: 51-61700 | File: D:\Acad\Safford\Drawings | Drawing: NOISE.DWG | Drwn by: KAD | Chk'd by: | Date: 4-29-97 | Rev: 4-29-98

PROJECT AREA



Scale 0 1 2 3 Miles

ARIZONA



KEY

LAND OWNERSHIP

- BLM
- STATE
- TRIBAL LANDS
- PHELPS DODGE
- PRIVATE

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

ESTIMATED SOUND PRESSURES AND GROUND MOTION (PEAK PARTICLE VELOCITIES, PPV) EMANATING FROM PROPOSED PIT MINES

FIGURE 4-2

HUMAN AND STRUCTURAL RESPONSE TO SOUND PRESSURE LEVELS AND THE RANGE OF SOUND PRESSURE LEVELS EXPECTED FROM AIR BLASTS

DECIBELS	LB/IN^2			
180	3	—	STRUCTURES DAMAGED	AIRBLAST FROM EXPLOSIONS
	1	—	MOST WINDOWS BREAK	
160	0.3			
	0.1	—	SOME WINDOWS BREAK	
140	0.03	—	"NO DAMAGE" LEVEL	
	0.01			
120	0.003	—	THRESHOLD OF PAIN	
		—	THRESHOLD OF COMPLAINTS (DISHES AND WINDOWS RATTLE)	
	0.001			
100	0.0003			
		—	RIVETER	
	0.0001			
80	3×10^{-5}			
60	3×10^{-6}	—	ORDINARY CONVERSATION	
40	3×10^{-7}	—	HOSPITAL ROOM	
20	3×10^{-8}	—	WHISPER	
0	3×10^{-9}	—	LEVEL OF HEARING	

(Source: Ladegaard-Pederson and Dally, 1975)

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

SOUND PRESSURE LEVELS AND RANGE EXPECTED FROM AIR BLASTS

FIGURE 4-3

Proj. #: 51-61700 | File: D:\Acad\Safford\Drawings | Drawing: SNDPRESS.DWG | Drwn by: JLJ | Chk'd by: | Date: 10-30-97 | Rev: 9-1-98

Matching Perspective of 3D Terrain Model*

Viewpoint Location Map*

* Note: The colors used in the Location Map and Perspective do not represent the actual colors used in the simulation.

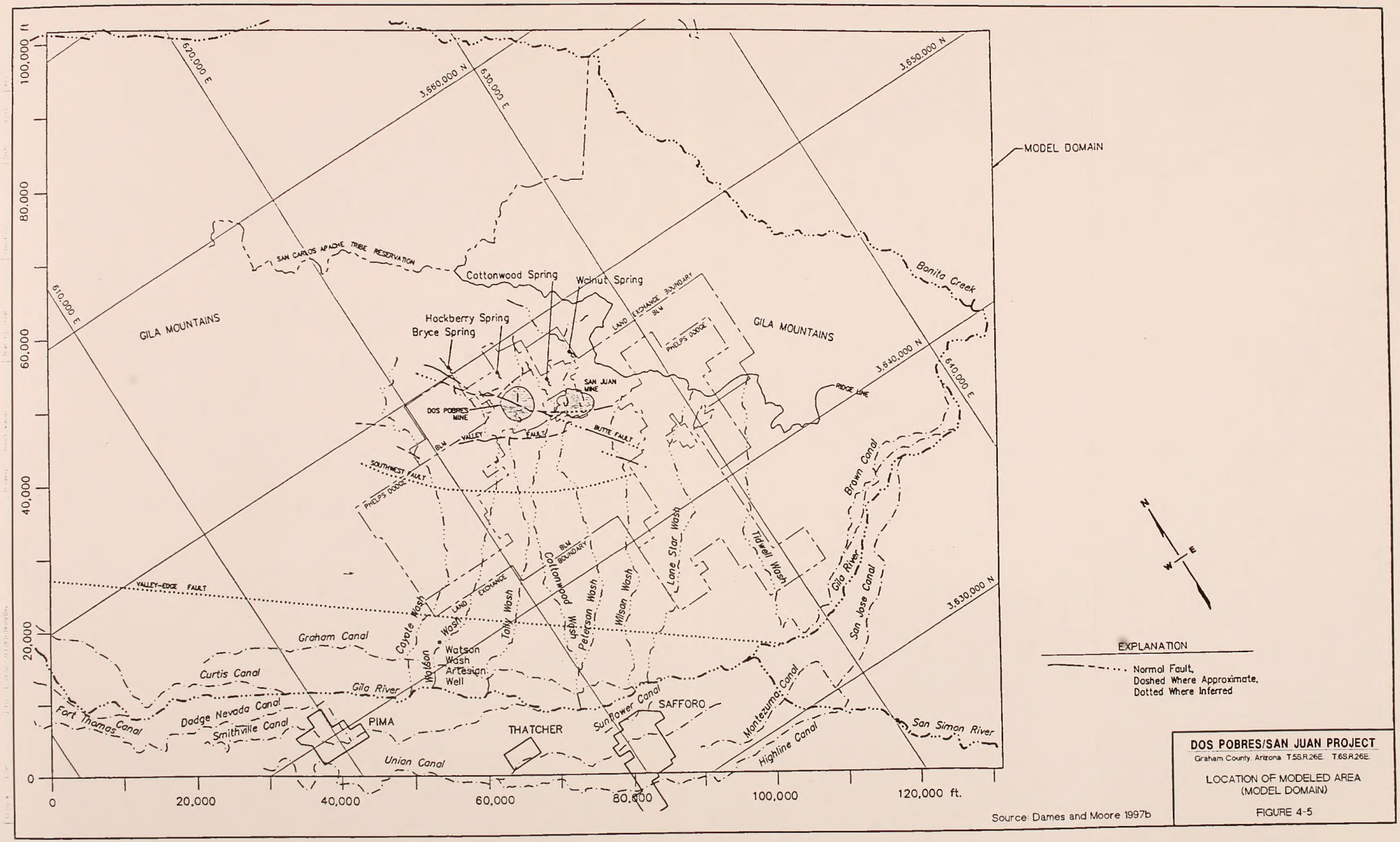
View Looking North from Highway 70 and 20th Avenue

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona

COMPUTER-GENERATED PHOTOGRAPHIC VISUAL SIMULATION OF THE PROJECT (400' LEACH PAD)

FIGURE 4-4



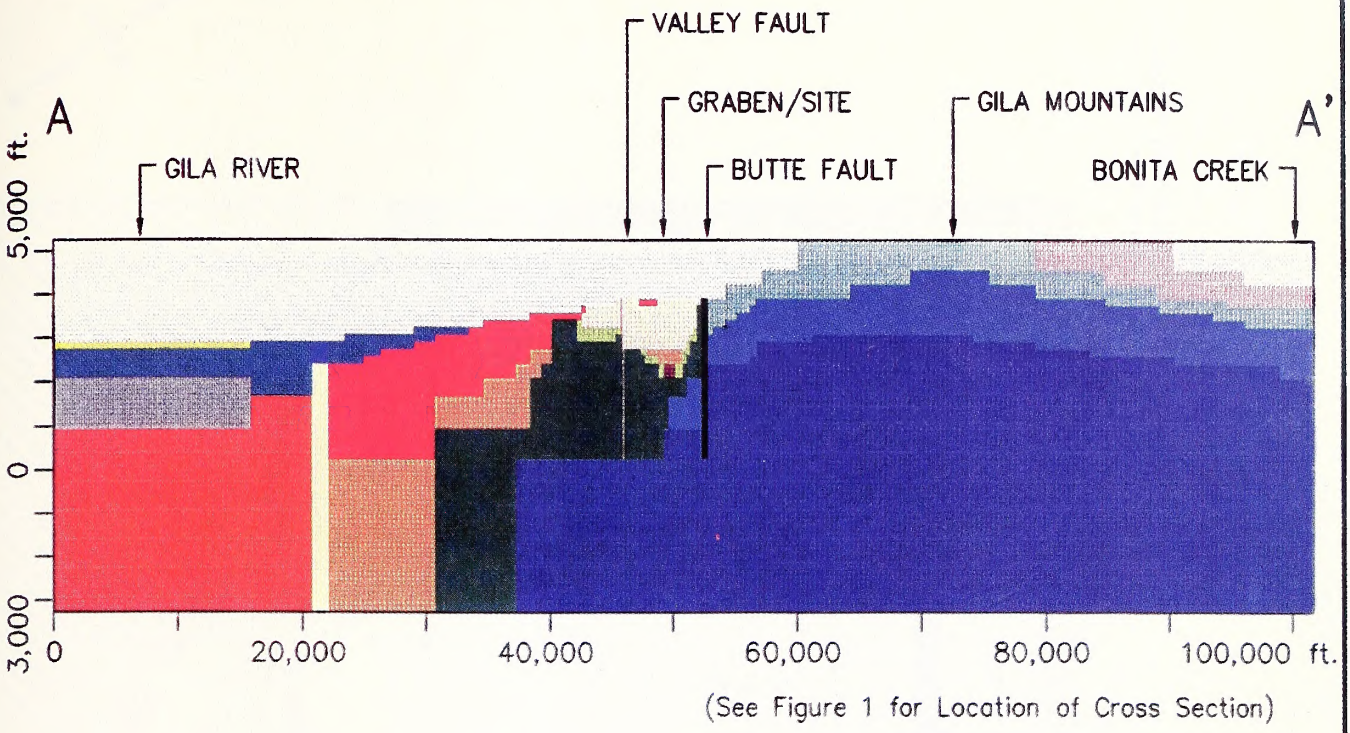
Source: Dames and Moore 1997b

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

LOCATION OF MODELED AREA
(MODEL DOMAIN)

FIGURE 4-5



(See Figure 1 for Location of Cross Section)

Material No.	Material Description	Hor. Cond. (ft/day)	Vert. Hydraulic Cond. (ft/day)	Specific Storage*(1/ft)	Specific Yield (-)
1	Lower Basin Fill	1.06E+01	4.20E-01	3.05E-08	0.15
2	Lake Beds of the Lower Basin Fill	3.94E-01	3.94E-03	3.05E-08	0.30
3	Upper Basin Fill	2.24E+02	2.24E+02	9.15E-04	0.15
4	Metavolcanic Unit (Baboon)	1.64E+00	5.48E-01	3.05E-08	0.05
5	Metavolcanic Unit (TKmv)	4.92E-03	1.64E-03	3.05E-08	0.05
6	Metavolcanic Unit (TKmv)	3.28E-03	1.09E-03	3.05E-08	0.05
7	Metavolcanic Unit (TKmv)	2.30E-04	7.64E-05	3.05E-08	0.05
8	Gila Mountain Volcanics (Tv)	1.64E+00	5.48E-01	3.05E-08	0.05
9	Gila Mountain Volcanics (Tv)	1.64E+00	5.48E-01	3.05E-08	0.05
10	Valley Fault	8.20E-05	8.20E-05	3.05E-08	0.05
11	Gila Mountain Volcanics (Graben)	1.64E+01	5.48E+00	2.29E-04	0.10
12	Valley-Edge Fault Zone	1.06E+01	4.20E-01	3.05E-08	0.15
13	NO FLOW	3.28E-03	1.09E-03	3.05E-08	0.05
14	P3 Fracture Zone	1.64E+01	5.48E+00	3.05E-08	0.05
15	Metavolcanic Unit (Baboon Altered)	1.64E-01	5.48E-02	3.05E-08	0.05
16	Gila Mountain Volcanics (Tv Altered)	1.64E-01	5.48E-02	3.05E-08	0.05
17	Gila Mountain Volcanics (Tv Altered)	1.64E-01	5.48E-02	3.05E-08	0.05
18	Butte Fault	2.46E-04	8.20E-05	3.05E-08	0.05
19	San Juan Alteration	8.20E-05	2.73E-04	3.05E-08	0.05
20	Valley-Edge Fault Zone	3.94E-01	3.94E-03	3.05E-08	0.30
21	Lower Basin Fill	1.12E+01	4.47E-01	9.15E-04	0.15
22	Metavolcanic Unit (TKmv)	8.20E-03	2.73E-03	3.05E-07	0.05
23	Metavolcanic Unit (TKmv)	8.20E-03	2.73E-03	3.05E-07	0.05
24	Lake Beds of the Lower Basin Fill (Evaporites)	8.86E-02	8.86E-04	3.05E-08	0.01

*Typical storage coefficient is specific storage x 164 ft.

(Source: Dames and Moore)

DOS POBRES/SAN JUAN PROJECT

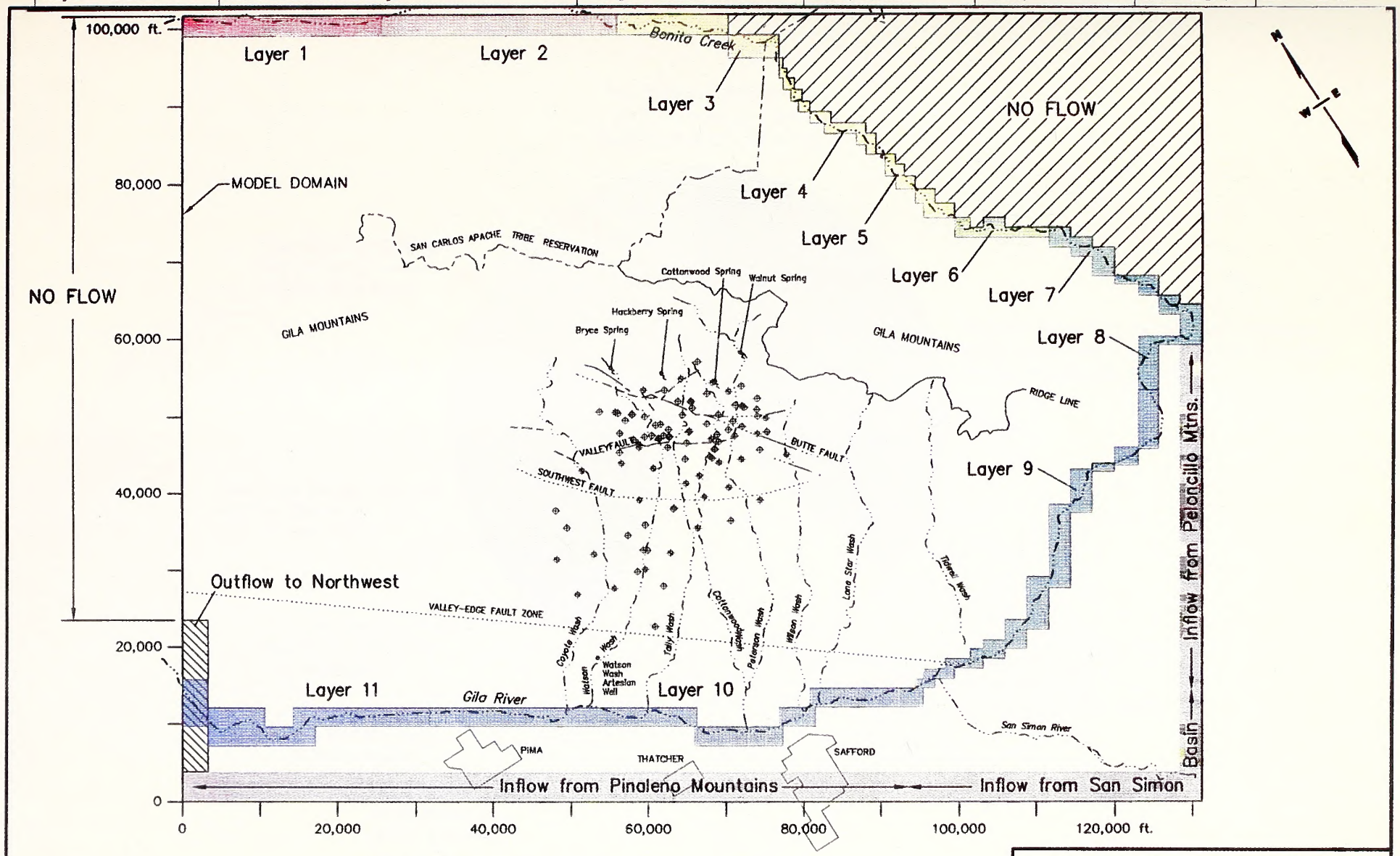
Graham County, Arizona

DISTRIBUTION OF HYDROGEOLOGICAL ZONES IN CROSS-SECTIONAL VIEW

FIGURE 4-6

Proj # 51-61700 | File: D:\Acad\Safford\Drawings | Drawing: DISTZONE.DWG | Drawn by: KAD/JLJ | Chk'd by: | Date: 10-27-97 | Rev: 4-25-98

Proj. #: 51-61700 | File: D:\Acad\Safford\Drawings | Drawing: MODEL BND.DWG | Drawn by: KAD/JLJ | Chk'd by: | Date: 10-27-97 | Rev: 4-25-98



EXPLANATION

Normal Fault, Dashed Where Approximate, Dotted Where Inferred

Monitoring Well Ground-Water Extraction Well, Piezometer

Layer 4 Layer 5

Indicates the Layer In Which a River Cell Resides

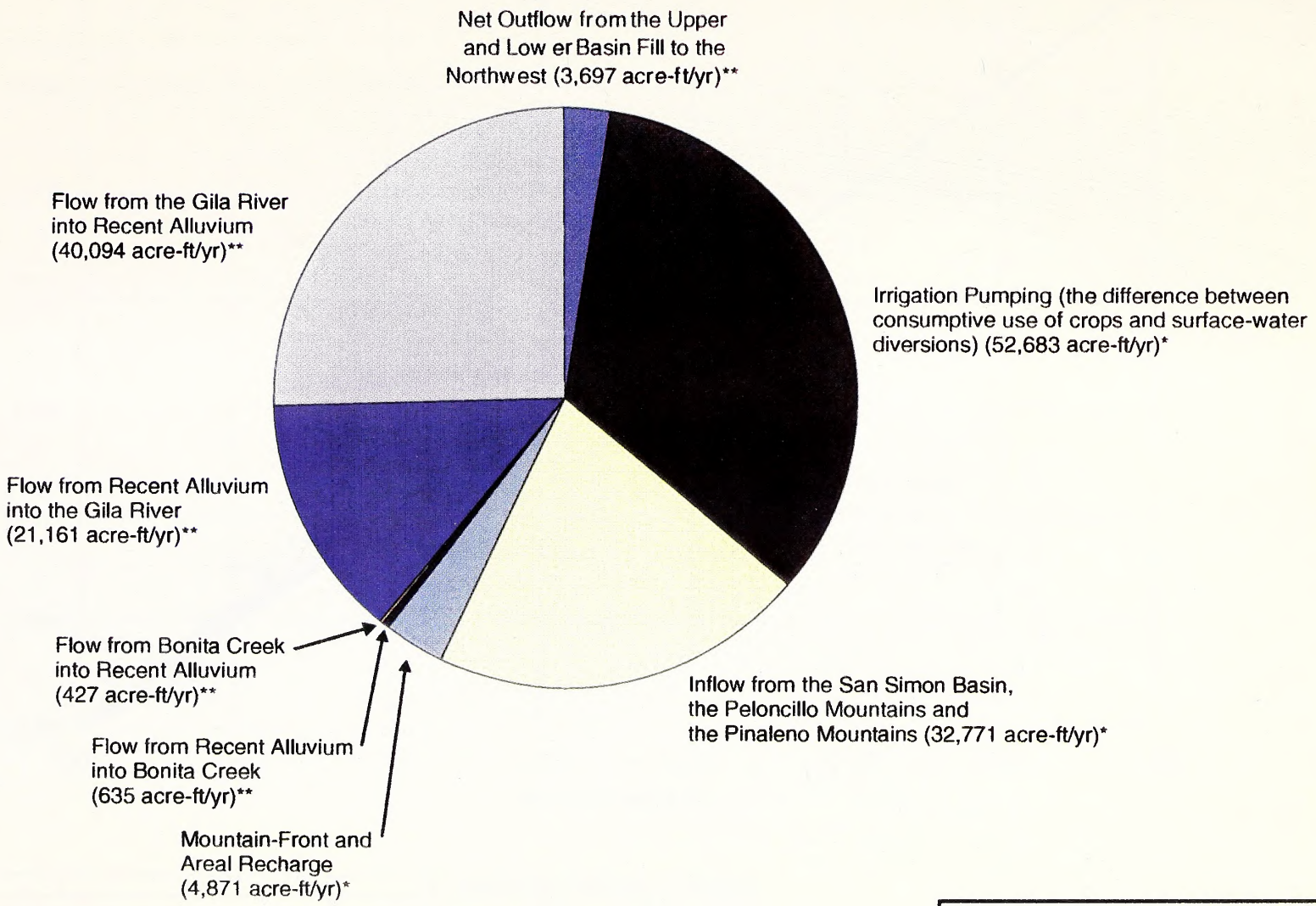
(Source: Dames and Moore)

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona

MODEL BOUNDARY CONDITIONS

FIGURE 4-7



* Input value based on published information
** Value resulting from calibration of model

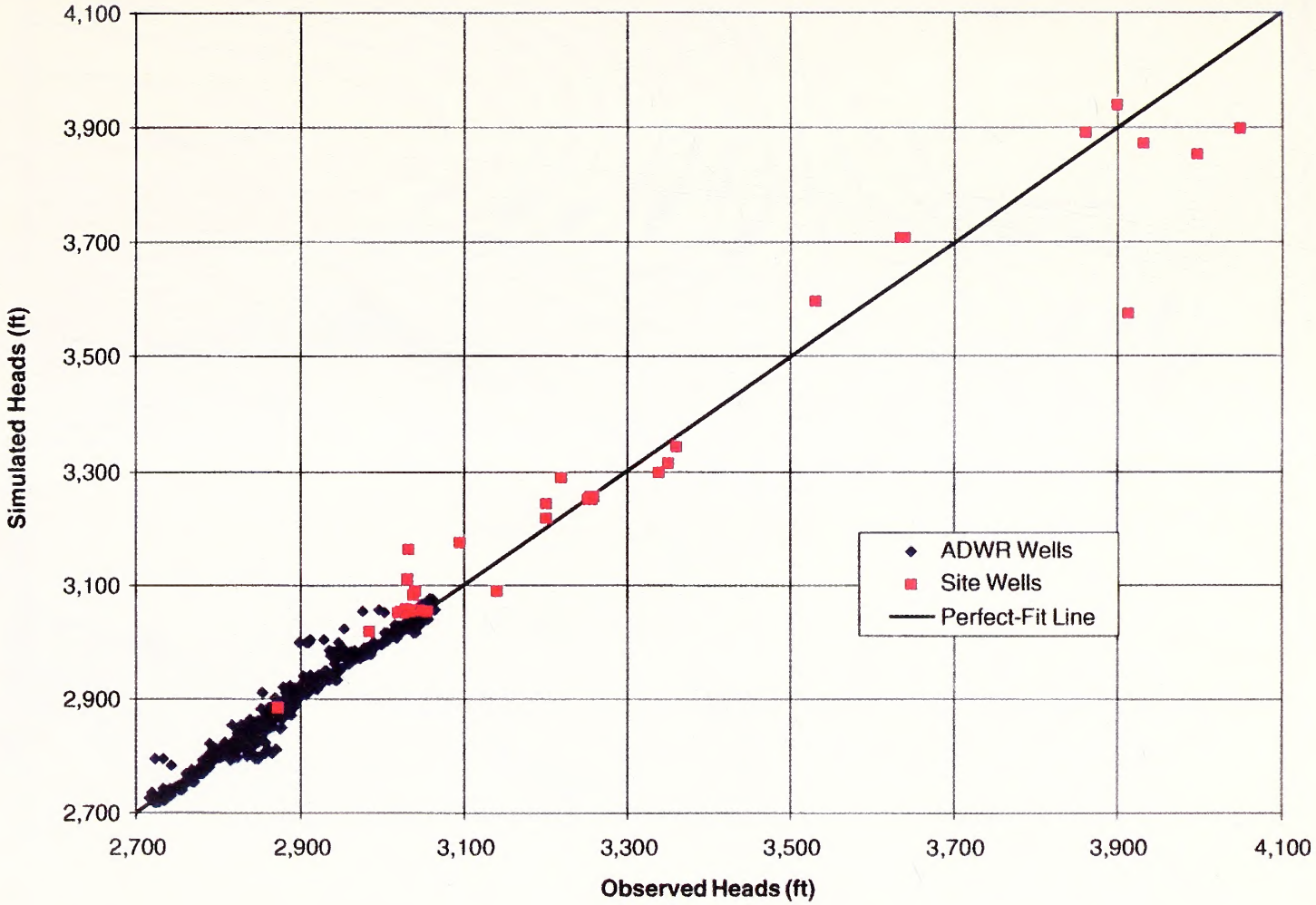
(Source: Dames and Moore)

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona

WATER BALANCE FOR CALIBRATED STEADY-STATE MODEL

FIGURE 4-8



Statistic	ADWR Wells	Site Wells	All Wells
Mean Error (ft)	3.66	7.05	3.99
Mean Absolute Error (ft)	12.15	40.30	14.82
Standard Deviation of Residuals (ft)	18.93	67.54	27.39
Coefficient of Determination Between Simulated and Observed Head (r^2)	0.98	0.98	0.99

(Source: Dames and Moore)

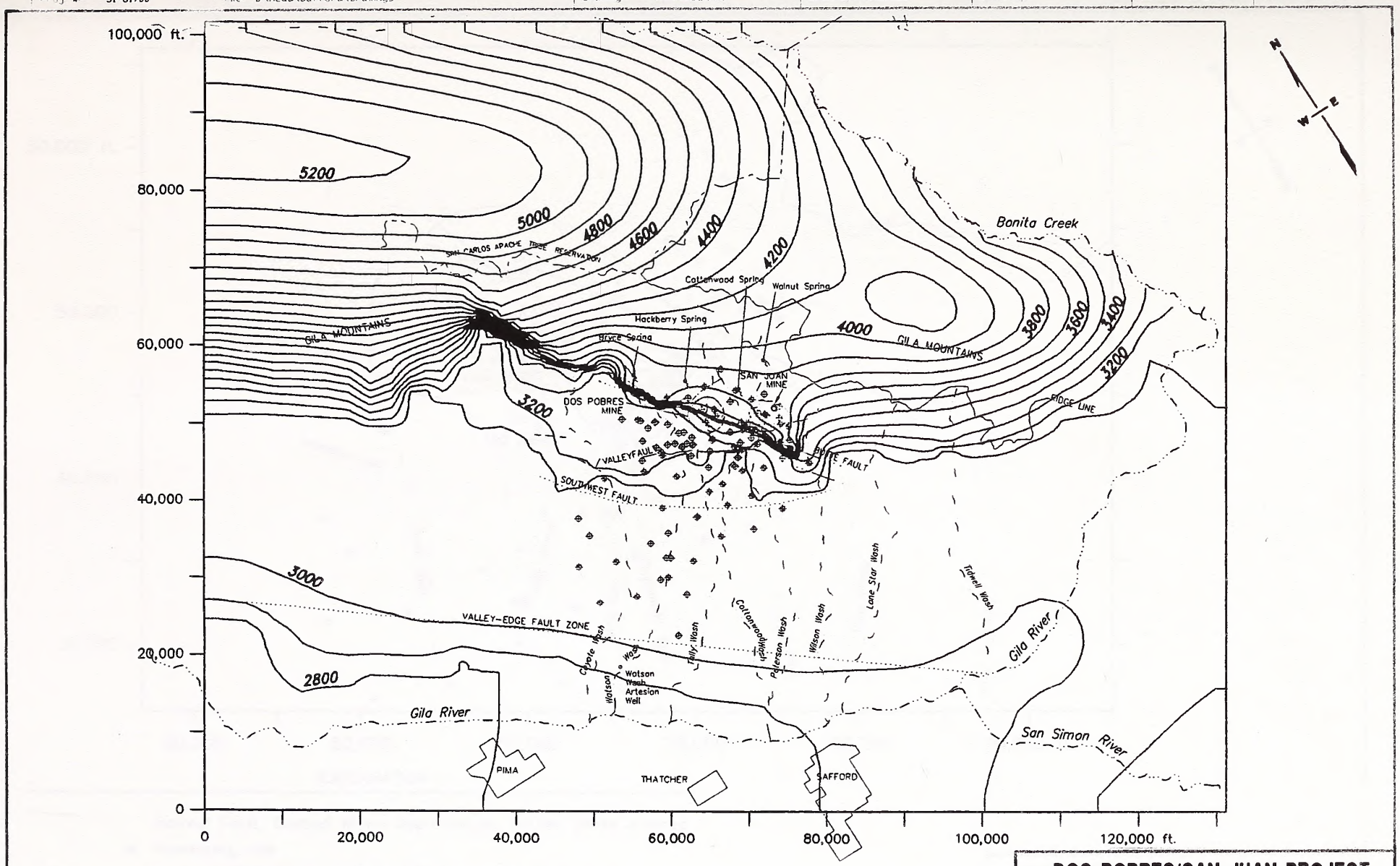
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona

OBSERVED vs. SIMULATED HEADS
FOR CALIBRATED STEADY-STATE MODEL

FIGURE 4-9

Proj #: 51-61700 | File: D:\Acad\Safford\Drawings | Drawing: WATRTABL.DWG | Drwn by: KAD/JLJ | Chk'd by: | Date: 10-27-97 | Rev: 4-29-98



EXPLANATION

Normal Fault, Dashed Where Approximate, Dotted Where Inferred

Monitoring Well

Ground-Water Extraction Well, Piezometer

2900 Water Table (ft. ASML, 100' interval)

(Source: Dames and Moore)

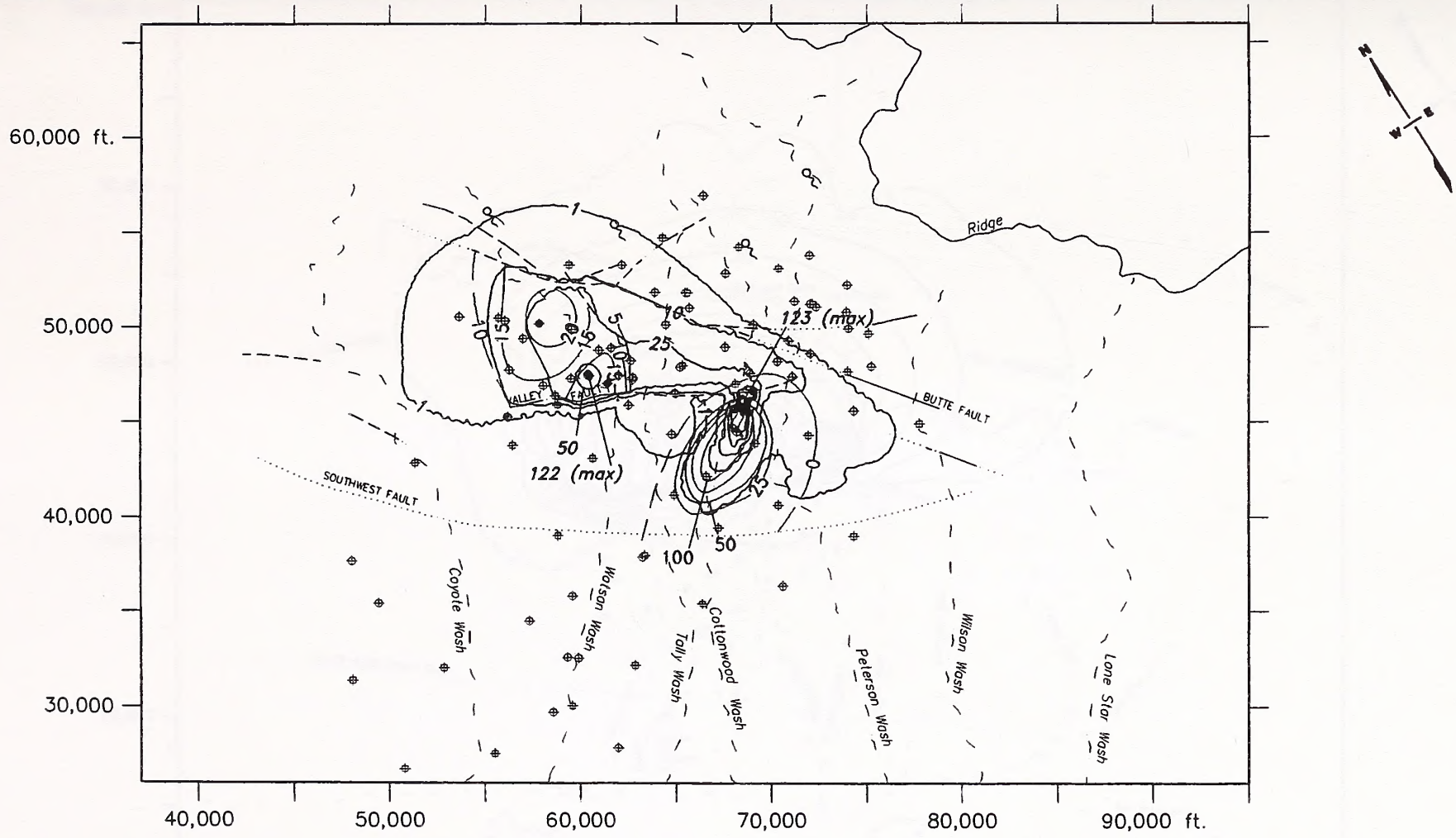
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona

PREDICTED GROUNDWATER LEVELS CALIBRATED FOR STEADY-STATE MODEL

FIGURE 4-10

Proj. #: 51-61700 | File: D:\Acad\Safford\Drawings | Drawing: DRAWDOWN.DWG | Drawn by: KAD/JLJ | Chk'd by: | Date: 10-27-97 | Rev: 4-25-98



EXPLANATION

- Normal Fault, Dashed Where Approximate, Dotted Where Inferred
- Monitoring Well
- Ground-Water Extraction Well, Piezometer
- Pumping Well
- Spring
- 10 Observed Drawdown (ft., variable interval)
- 50 Simulated Drawdown at 144 Days, (ft., variable interval)

(Source: Dames and Moore)

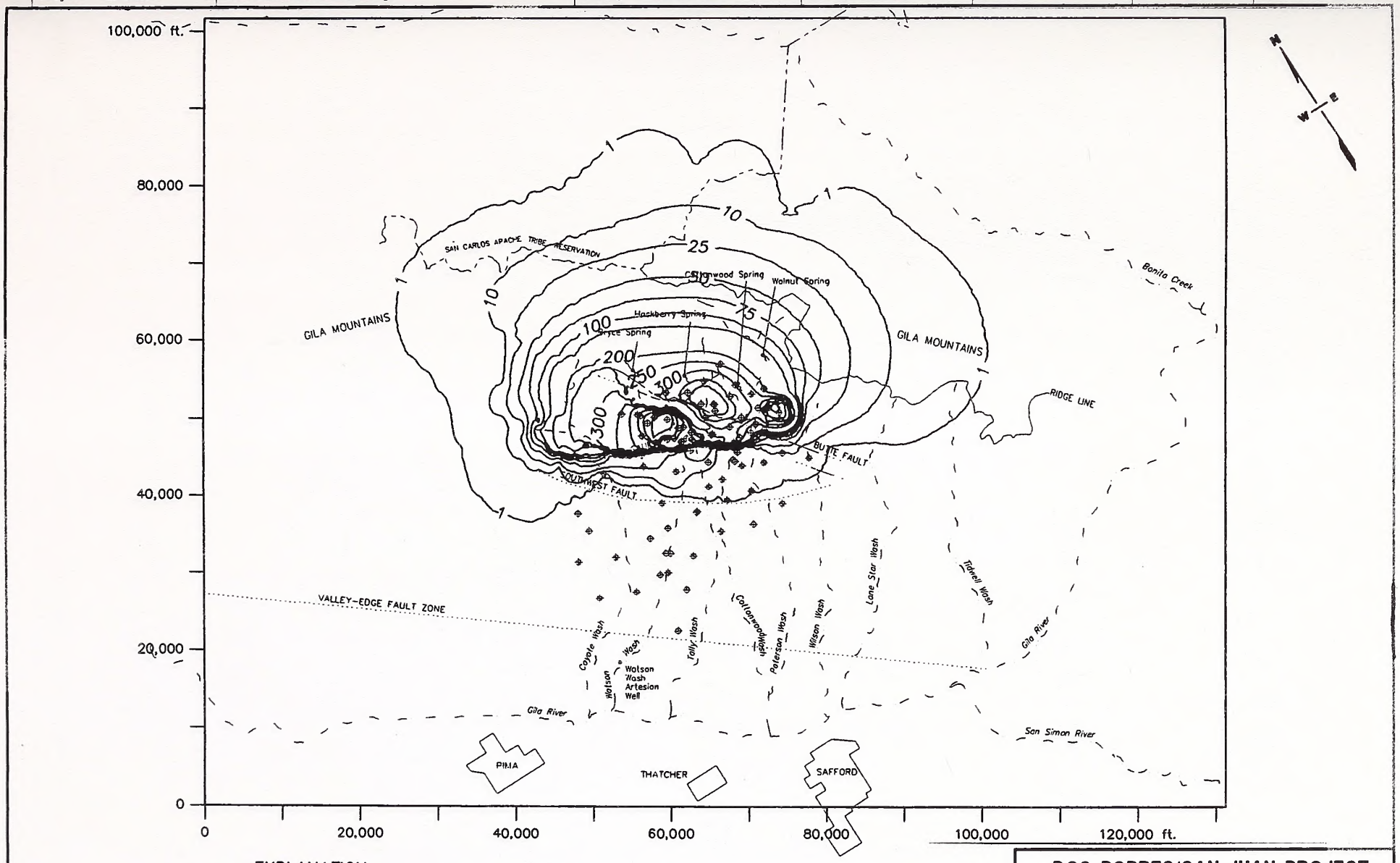
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona

SIMILATED AND OBSERVED DRAWDOWN FOR TRANSIENT CALIBRATED MODEL

FIGURE 4-11

Proj #: 51-61700	File: D:\Acad\Safford\Drawings	Drawing: PROPACT1.DWG	Drwn by: KAD/JLJ	Chk'd by:	Date: 10-27-97	Rev: 4-25-98



EXPLANATION

Normal Fault, Dashed Where Approximate, Dotted Where Inferred

Monitoring Well

Ground–Water Extraction Well, Piezometer

50 Drawdown (ft., variable interval)

(Source: Dames and Moore)

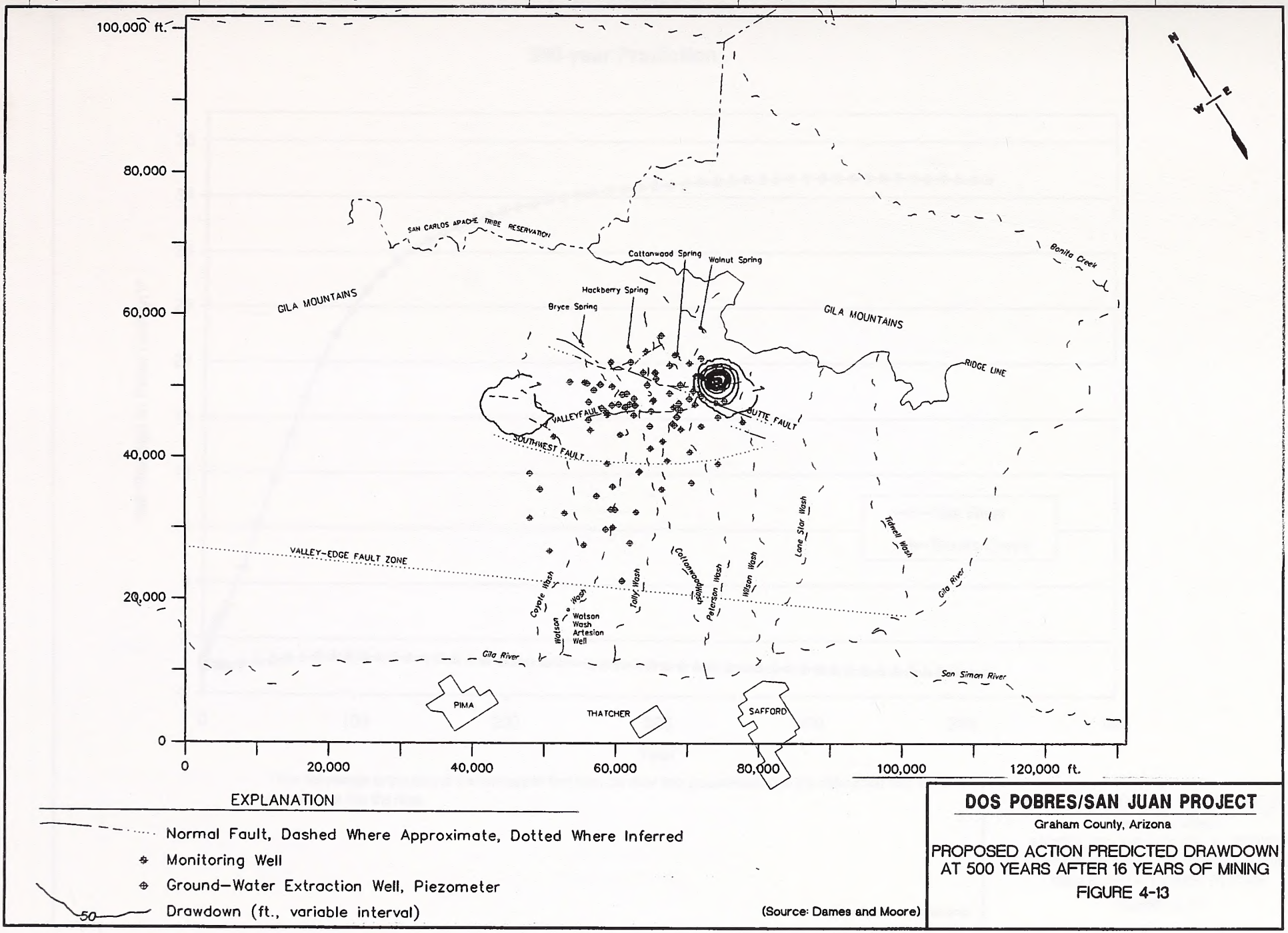
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona

PROPOSED ACTION
PREDICTED DRAWDOWN AT 16 YEARS

FIGURE 4-12

Proj #: 51-61700	File: D:\Acad\Safford\Drawings	Drawing: PROPACT2.DWG	Drwn by: KAD/JLJ	Chk'd by:	Date: 10-27-97	Rev: 4-25-98



EXPLANATION

Normal Fault, Dashed Where Approximate, Dotted Where Inferred

Monitoring Well

Ground-Water Extraction Well, Piezometer

50 Drawdown (ft., variable interval)

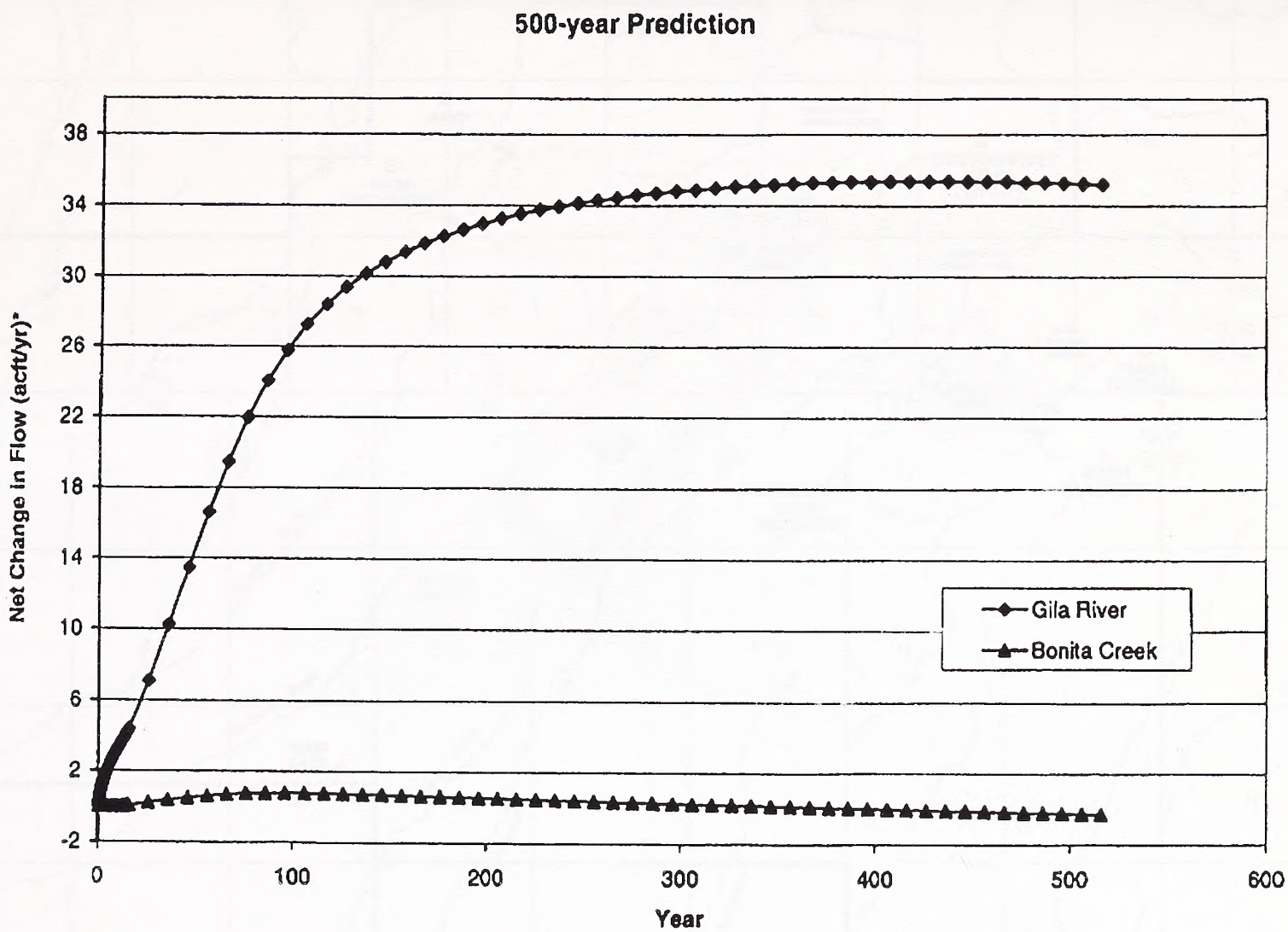
(Source: Dames and Moore)

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona

PROPOSED ACTION PREDICTED DRAWDOWN AT 500 YEARS AFTER 16 YEARS OF MINING

FIGURE 4-13



* The net change is the sum of the increase in flow from the river into groundwater plus the diminished flow from groundwater into the river.

(Source: Dames and Moore)

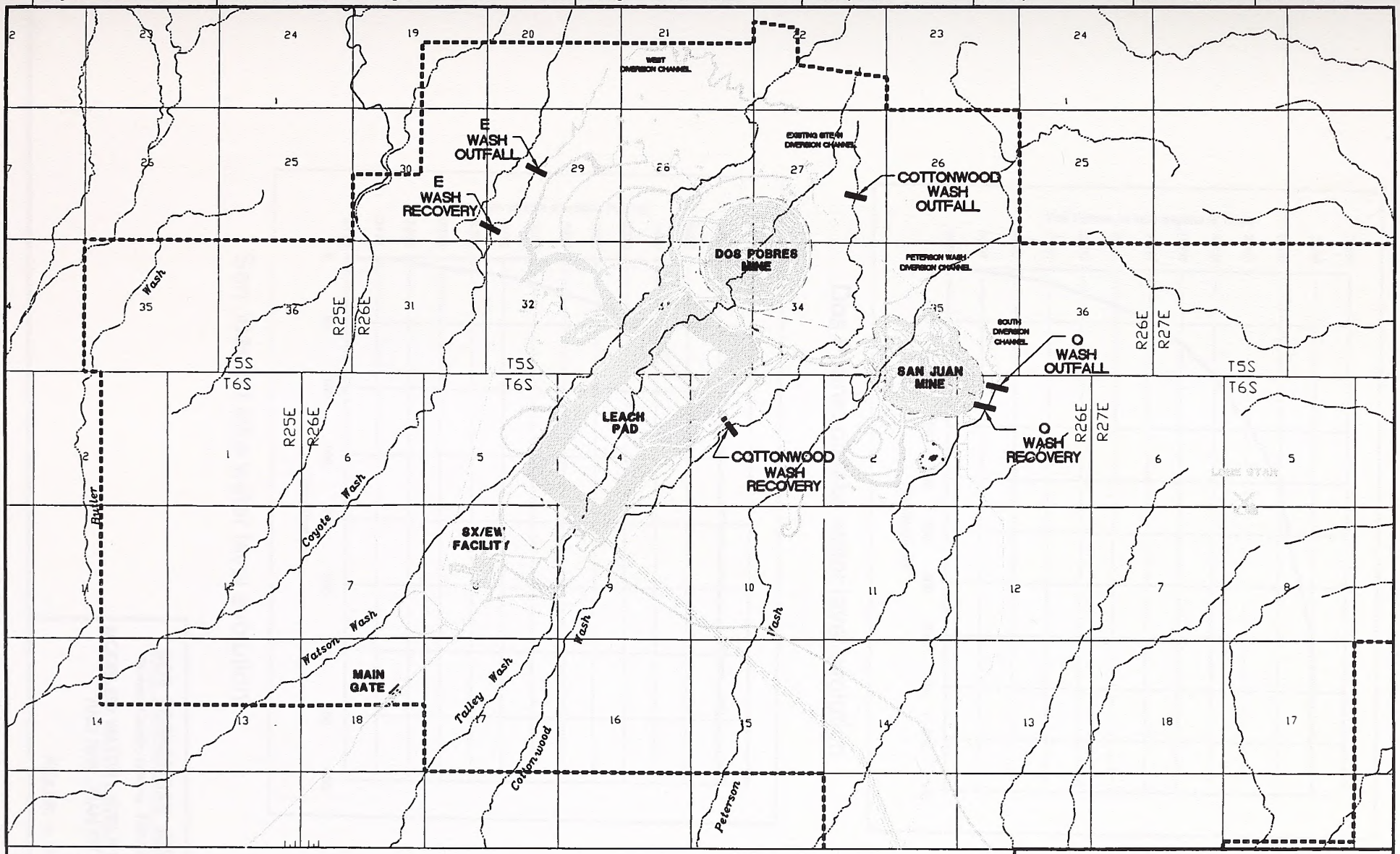
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona

MODELED IMPACT OF ALTERED GROUNDWATER FLOW ON GILA RIVER AND BONITA CREEK FLOWS

FIGURE 4-14

Proj. #: 51-61700 | File: C:\Acadll\Safford\Drawings | Drawing: IMPACT-WAT.DWG | Drwn by: KAD | Chk'd by: | Date: Date | Rev: 4-29-98



N

Scale

0 2000 4000

FEET

KEY

WATERSHED BOUNDARY

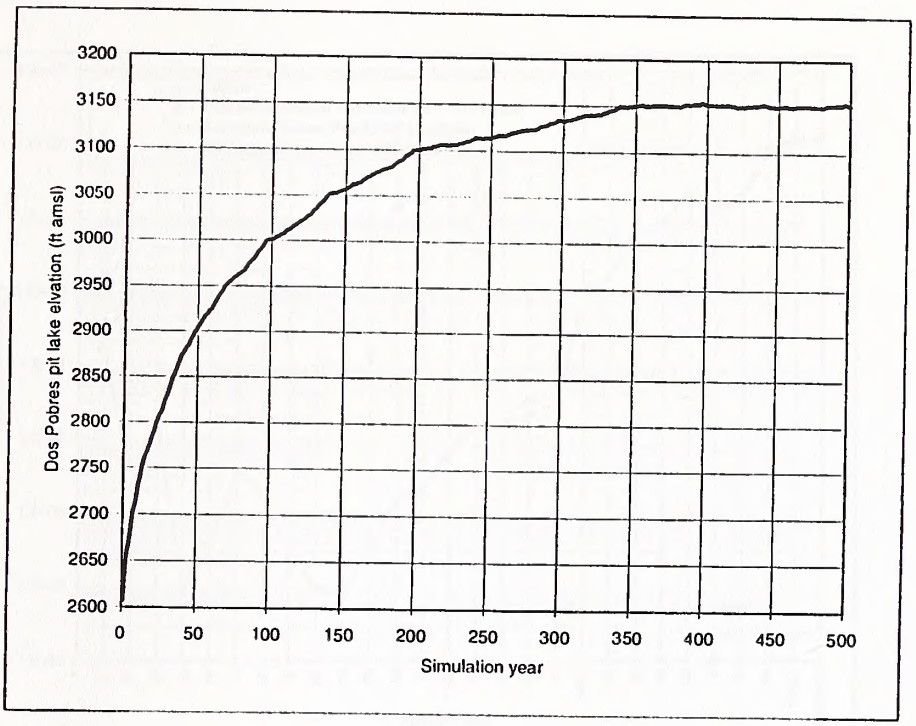
MAJOR DRAINAGE

DOS POBRES/SAN JUAN PROJECT

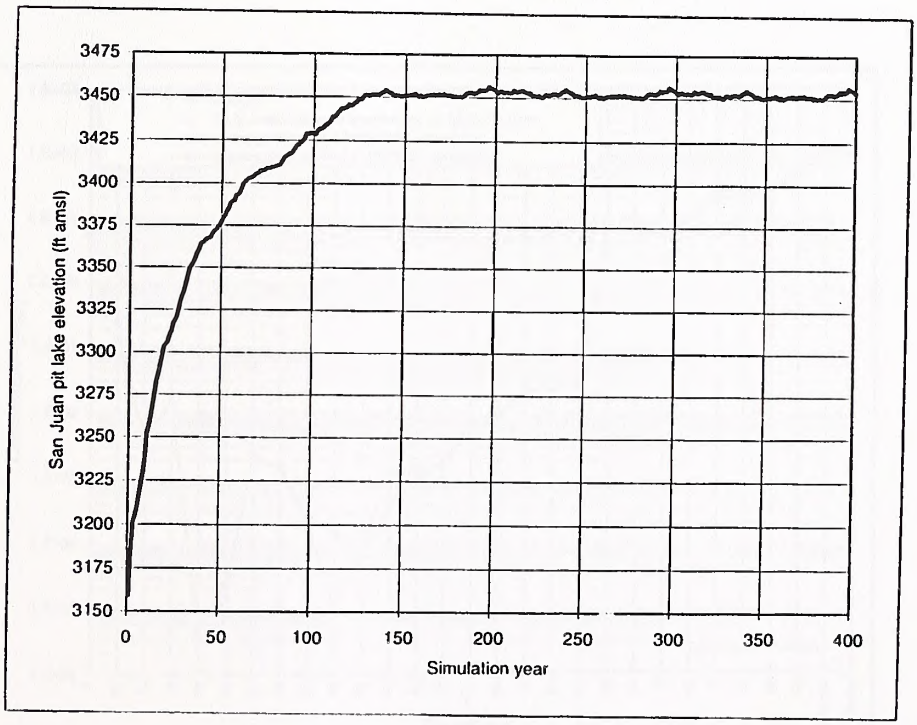
Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

WASHES WITH ALTERED FLOWS WITH OUTFALL AND RECOVERY POINTS

FIGURE 4-15



Dos Pobres pit lake water level evolution



San Juan pit lake water level evolution

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

MODELED WATER LEVELS IN DOS POBRES AND SAN JUAN PIT LAKES

FIGURE 4-16

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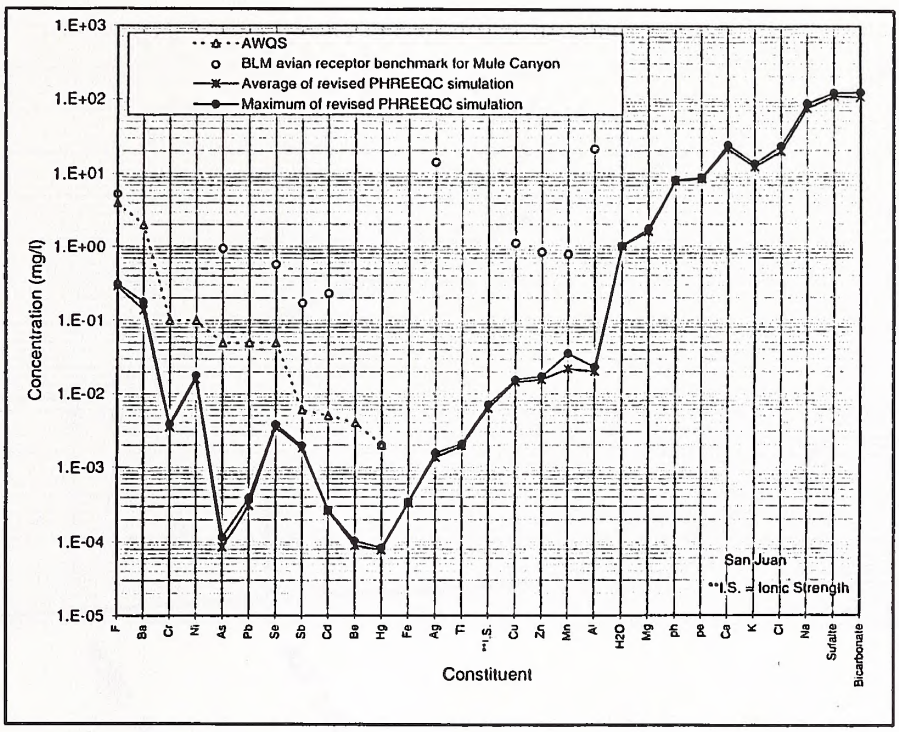
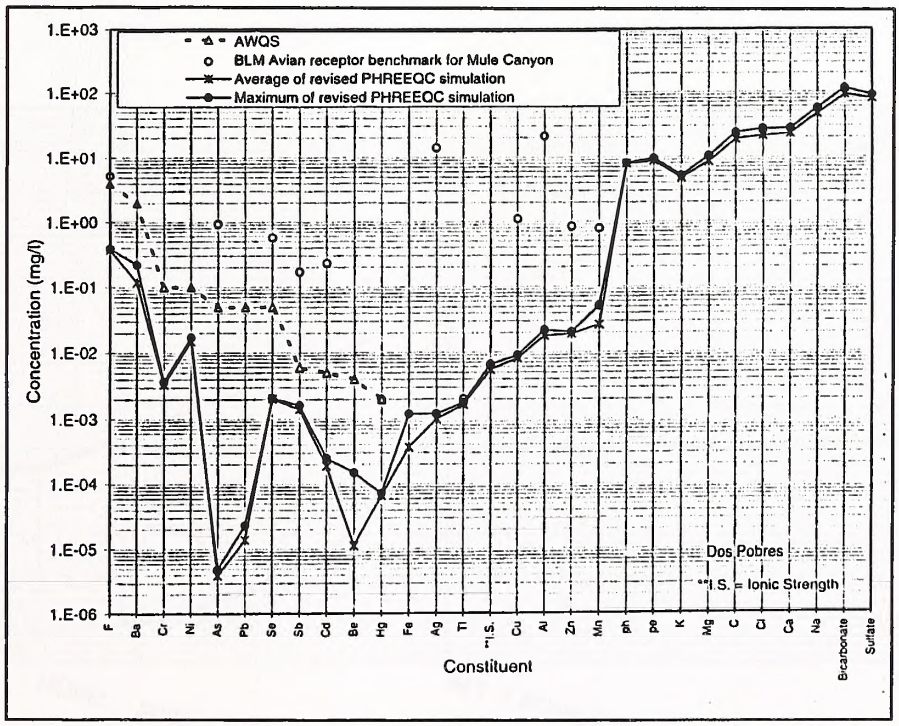


Dos Pobres Pit Lake Chemistry and Standards



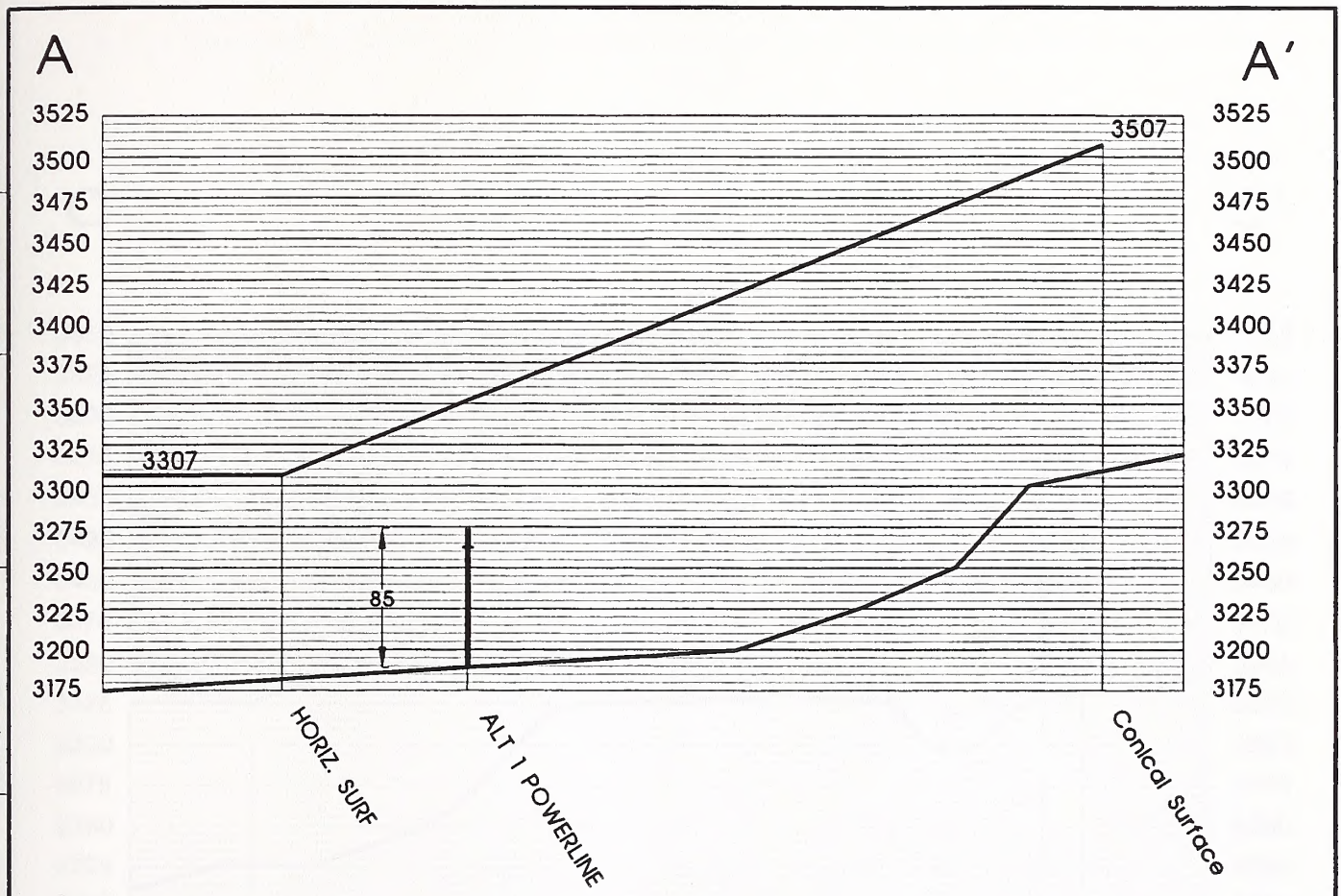
San Juan Pit Lake Chemistry and Standards

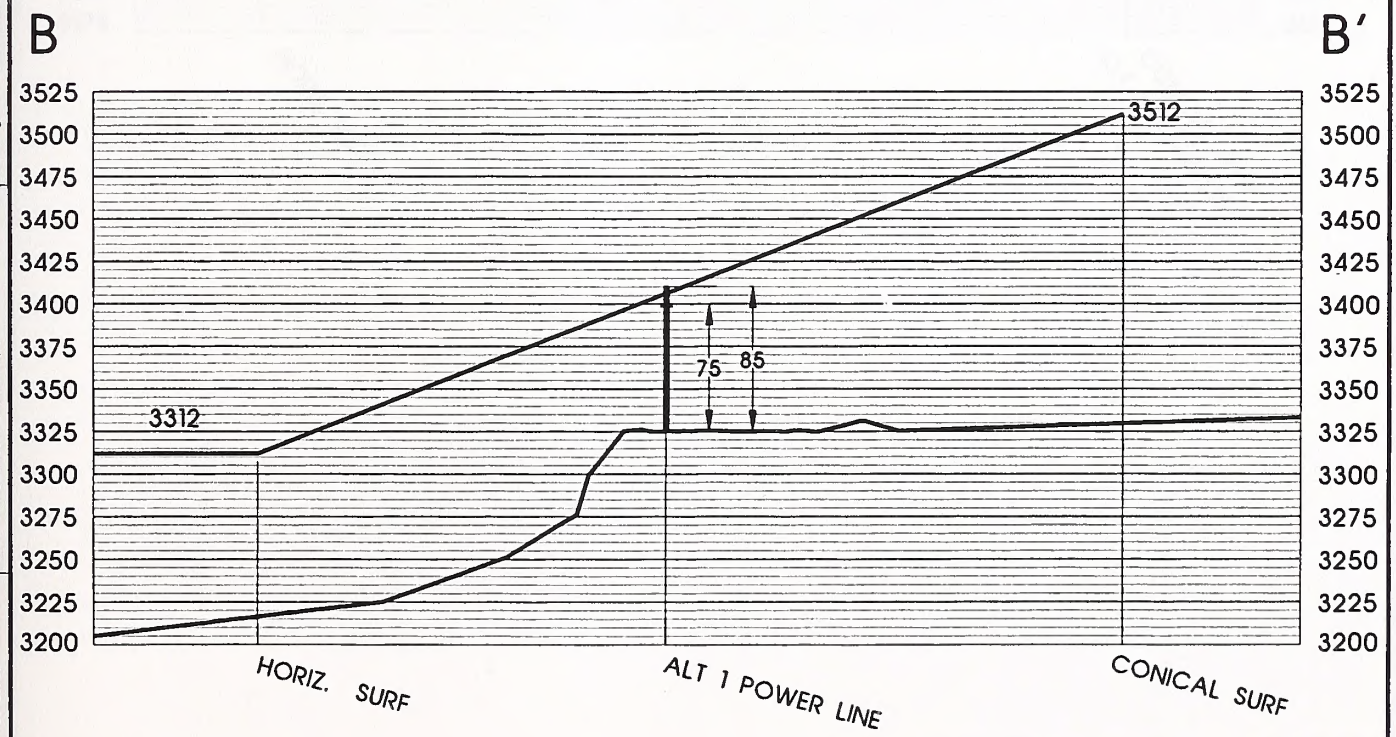
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

MODELED PIT LAKE WATER CHEMISTRY COMPARED TO WATER QUALITY STANDARDS

FIGURE 4-17





Scale

0 500 1000

FEET

HORIZONTAL SCALE 1" = 1000'

VERTICAL SCALE 1" = 125'

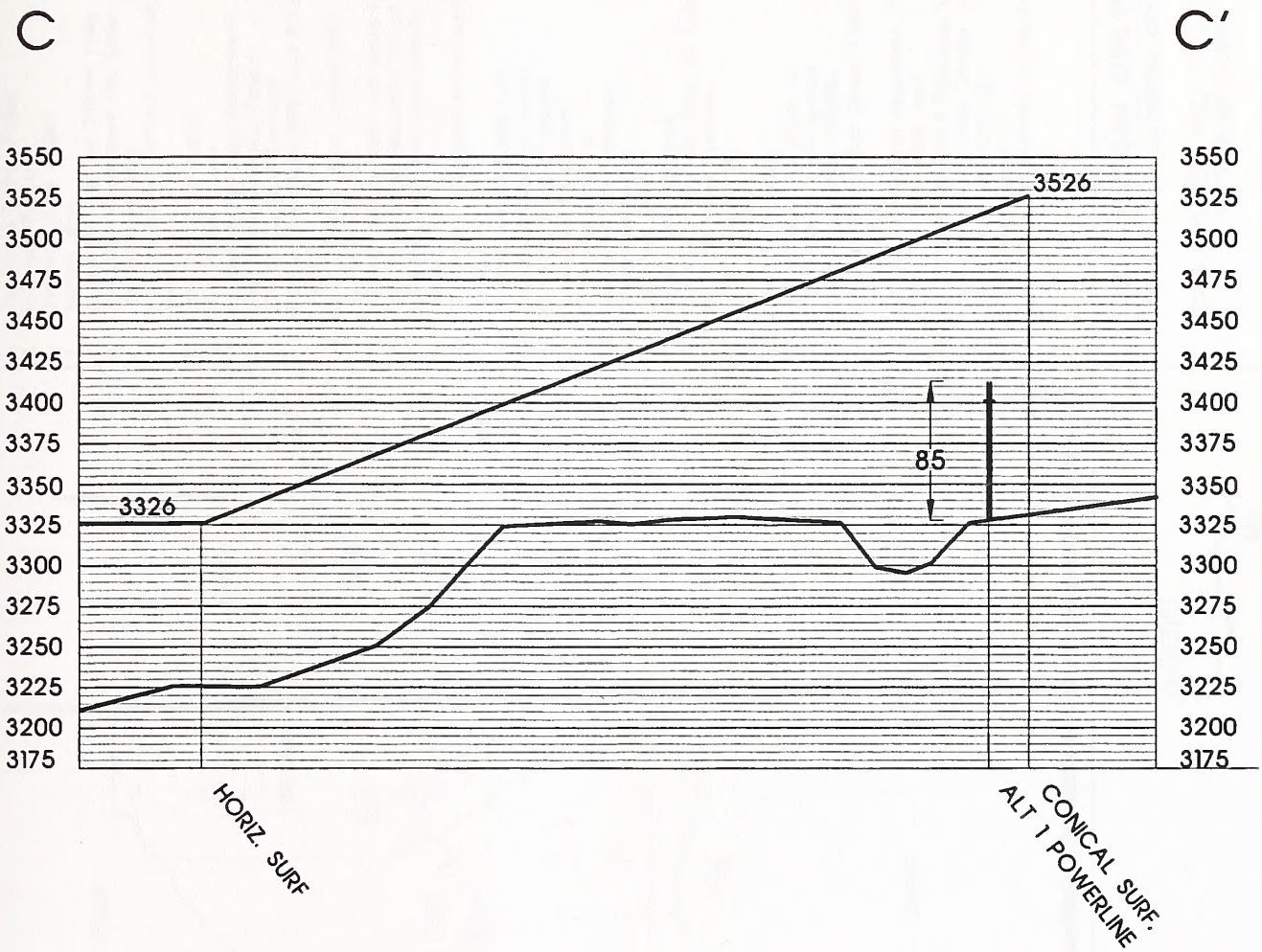
DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

CROSS SECTIONS SHOWING RELATIONSHIP OF PROPOSED POWERLINES TO HORIZONTAL AND CONICAL SURFACES -- SECTIONS A-A' AND B-B'

FIGURE 4-18

Rev: 4-29-98 | Date: 5-6-79 | Chk'd by: | Drwn by: KAD | Drawing: XSECT1.DWG | File: D:\Acad\Safford\Newpo | Proj #: 51-61700



Scale

0 500 1000

FEET

HORIZONTAL SCALE 1" = 1000'

VERTICAL SCALE 1" = 125'

DOS POBRES/SAN JUAN PROJECT

Graham County, Arizona T.5S.R.26E. T.6S.R.26E.

CROSS SECTIONS SHOWING RELATIONSHIP OF PROPOSED POWERLINES TO HORIZONTAL AND CONICAL SURFACES -- SECTION C-C'

FIGURE 4-19

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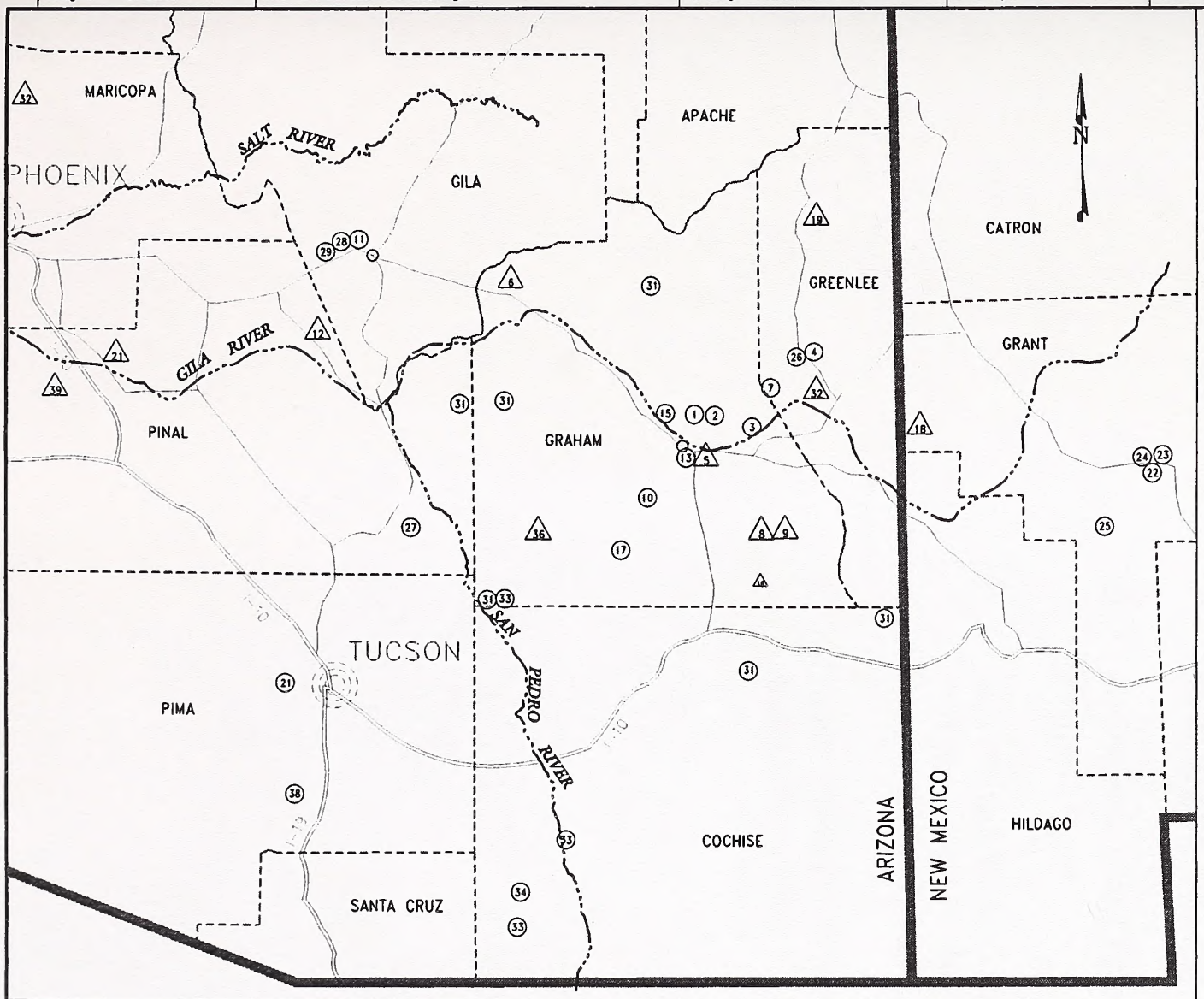

1. Dos Pobres Sulfide Project
2. Lone Star Project
3. Sanchez Copper Project
4. Morenci Mine
5. Agricultural Practices Safford Valley
6. Agricultural Development San Carlos Apache Reservation.
7. Gila Box Riparian National Conservation Area.
8. BLM Grazing Settlement
9. BLM Grazing Leases
10. Mt. Graham Telescope Development
11. CMMC Leach Expansion Project
12. ASARCO Ray Land Exchange
13. Safford Conventional WWTP and Reuse Project
14. City of Safford Water Development Bonita Creek
15. Thatcher Wetland WWTP and Reuse Project
16. San Simon Valley Restoration Project
17. AGFD Ash Creek Water Development Project
18. Gila-Monster (Non-point source working group)
19. Forestry National Forest Lands
20. Abandoned Mines (not shown)
21. Gila River Indian Community Agricultural Development
22. Chino Mine Expansion
23. Continental Mine Expansion
24. Copper Flat Project
25. Little Rock Mine
26. Morenci Land Exchange
27. San Manuel Mine and Proposed Expansion
28. BHP Pinto Valley Operations
29. Carlotta Copper Co.
30a. Rosemont MPO
30b. Rosemont Exchange
31. Arizona Desert Wilderness Act
32. Wild & Scenic Rivers Analysis
33. Nature Conservancy Activities
34. Base Realignment and Closure (BRAC) Ft. Huachuca
35. Existing Environmental Regulations (CWA, CAA, APP, ESA, NHPA, etc.)
36. BLM/Arizona State Land Exchanges (Mule Shoe Ranch, San Pedro River, Cienega Creek
37. BLM Hualapai Mtn. Exchange
38. Mission Mine Expansion
39. Gila River Indian Community Farm Expansion

(34) LOCATION SPECIFIC

(16) REGIONAL EFFECT

Scale
0 35
MILE

DOS POBRES/SAN JUAN PROJECT

SHOWINGS PARTS OF S.E. ARIZONA AND NEW MEXICO

PAST, PRESENT AND FORESEEABLE FUTURE ACTIONS

FIGURE 4-20

Volume 2

Appendices

A. 404 (b)(1) Alternatives Analysis

B. Legal Descriptions of Selected and Offered Lands

C. VRM Class Objectives

D. Archaeological Sites in the Project Area

E. Descriptions of Offered Lands Not Included in the Land Exchange Alternative

F. Draft Mitigation and Monitoring Plan

APPENDIX A

404 (b)(1) ALTERNATIVES ANALYSIS

DOS POBRES/SAN JUAN PROJECT

404(b)(1) ALTERNATIVES ANALYSIS

Submitted to

U.S. ARMY CORPS OF ENGINEERS

Submitted by:

PHELPS DODGE SAFFORD, Inc

-Revised-

October 1997

DOS POBRES/SAN JUAN PROJECT
404(b)(1) ALTERNATIVES ANALYSIS

Submitted to:

U.S. ARMY CORPS OF ENGINEERS
Los Angeles District, Regulatory Branch
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October 31, 1997

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EXECUTIVE SUMMARY

An alternatives analysis is required by the U.S. Army Corps of Engineers (COE) and the U.S. Environmental Protection Agency (EPA) to demonstrate compliance with guidelines established under the Clean Water Act (CWA), Section 404(b)(1) (40 CFR §230) for avoidance and minimization of impacts to jurisdictional waters of the United States. This analysis is designed to identify practicable alternatives for the Dos Pobres/San Juan Project proposed by Phelps Dodge Safford, Inc. (PDSI)

The formulation of alternatives to the proposed Mining Plan of Operations (the Proposed Action) has been based upon information provided by the COE, BLM, and PDSI. Each alternative's practicability, in light of specific technical, logistic, and economic criteria, is evaluated. Many of the alternatives considered were developed to minimize impacts to waters of the United States which in the project area are primarily ephemeral washes. Xeroriparian habitats associated with these washes are of relatively low value[1] when compared to other xeroriparian and riparian habitats in southern Arizona. None of the alternatives considered would completely avoid impacts to waters of the U.S. and all practicable alternatives would affect waters of the United States to varying degrees.

A total of nine configuration alternatives (Alternatives A-I), two Safford District location alternatives (J and K), two compactible soil borrow source alternatives, and two SX/EW location alternatives (listed below) were considered.

Of the nine configuration alternatives and two Safford District location alternatives considered, only Alternative C, *Partial Backfill of San Juan Pit*, and Alternative I, *Single, Reduced Leach Pad/Crush Convey w/ Haul Truck Placement*, are practicable, considering technical, logistic, and economic measures of practicability. The alternatives considered represents a reasonable range of alternatives that exist to achieve the project's purpose and need and are technically capable of being accomplished. All alternatives eliminated were considered impracticable for logistic and/or economic reasons. Considering the constraints imposed by the ore bodies, the distribution of other ore reserves in the project area, and the nature and distribution of waters of the U.S. in the project area, the development of another practicable alternative similar or not to the alternatives considered in this analysis, that significantly minimizes or avoids impacts to waters of the United States, is unlikely.

---

[1] Total vegetation volume (TVV) within the ephemeral arroyos in the project area typically ranges from a value of 0.25 to 0.65 m^3/m^2 and averages approximately 0.45 m^3/m^2. Upland habitats on this property have vegetation volume of from 0.1 to 0.33 m^3/m^2. and averaged approximately 0.25 m^3/m^2. For comparison, well-vegetated upland Sonoran Desert Scrub habitat in Northwest Tucson will typically have TVV slightly greater than 0.5 m^3/m^2; Mesquite Bosques typically exceed 1.5 m^3/m^2 and mature Cottonwood/Willow riparian habitats typically exceed 3.0 m^3/m^2.

- Alternative A — Two Leach Stockpiles
- Alternative B — Single Leach Stockpile w/Conveyor Stacker
- Alternative C — Partial Backfill of San Juan Pit
- Alternative D — Reduced San Juan Pit
- Alternative E — Dos Pobres Mine Only
- Alternative F — San Juan Mine Only
- Alternative G — No Set Back at Dos Pobres
- Alternative H — A Single 700 ft. High Leach Stockpile
- Alternative I — Single Leach Stockpile/Crush Convey w/ Haul Truck Placement
- Alternative J — Develop Sanchez Mine First
- Alternative K — Develop Lone Star Mine First
- Lone Star Compactible Soil Borrow Source
- Watson Wash/Reduced Lone Star Compactible Soil Borrow Source
- East SX/EW Plant Location
- West SX/EW Plant Location

Only the Lone Star compactible soil borrow source alternative is considered logistically and economically practicable. Both of the SX/EW location alternatives are practicable. Each of these alternatives would be sited to minimize impacts to waters of the United States. The East SX/EW facility would require construction of a pipeline corridor to transport pregnant leach solution (PLS) and raffinate solution between the SX/EW plant and the leach stockpile. This alternative would result in pipeline crossings of approximately six drainages identified as waters of the United States, including Talley, Cottonwood, Peterson, and Wilson Washes.

1. INTRODUCTION

1.1. DOCUMENT PURPOSE AND ORGANIZATION

Phelps Dodge Safford, Inc. (PDSI) has submitted a Mining Plan of Operations (MPO) for the Dos Pobres/San Juan Project north of Safford, Arizona (Figure 1A). An alternatives analysis is required by the U.S. Army Corps of Engineers (COE) and the U.S. Environmental Protection Agency (EPA) to demonstrate compliance with guidelines established under the Clean Water Act (CWA), Section 404(b)(1) (40 CFR §230) for avoidance and minimization of impacts to jurisdictional waters of the United States. This analysis is designed to identify practicable alternatives for the Dos Pobres/San Juan Project proposed by PDSI based upon technical, logistic, and economic criteria. This analysis will be integrated into the *Dos Pobres/San Juan Project Mining Plan of Operations EIS.*

The alternatives analysis is presented in four sections:

1) This *Introduction* (Section 1) which includes the project background and history, the project's purpose and need statement, and a description of the proposed project area;

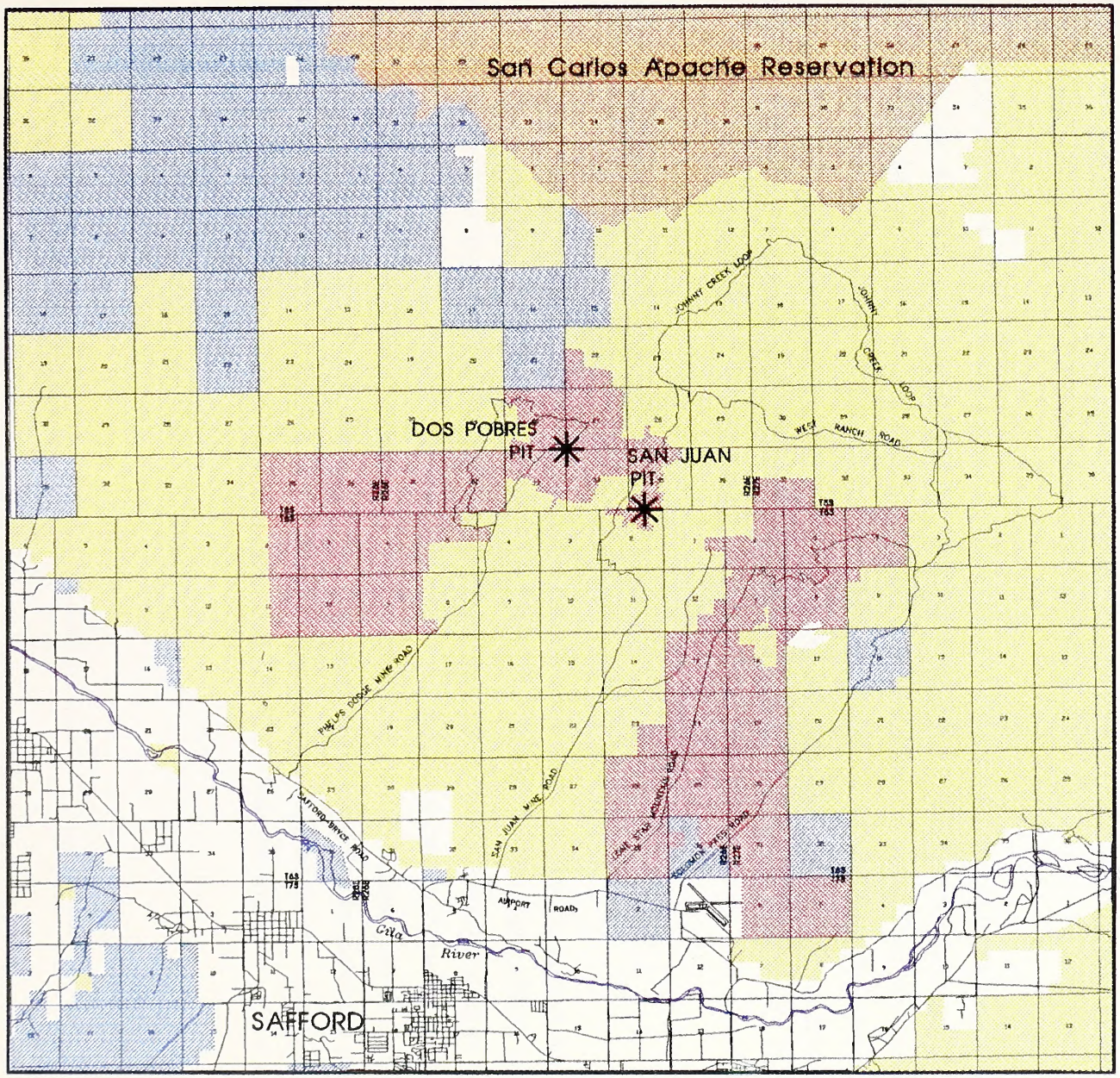
2) Section 2, *Formulation and Analysis of Alternatives*, which includes: a) a description of the general approach taken in formulating alternatives, including description of the geographic scope of the alternatives; b) a description of the practicability criteria; and c) description and practicability analysis of each of the alternatives identified; and

3) Section 3, a summary of the results of the practicability evaluation.

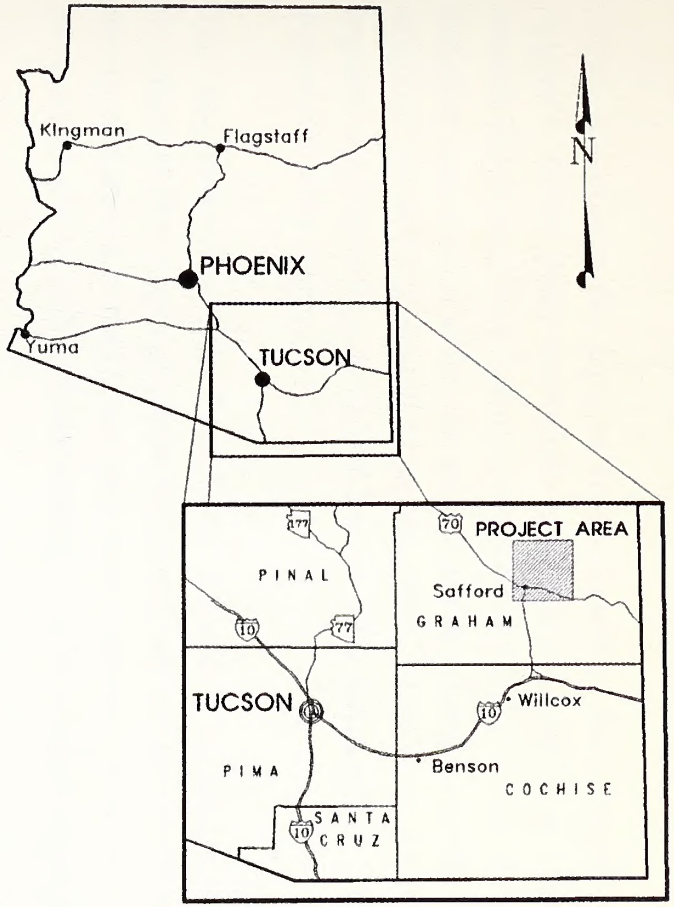
1.2. PROJECT HISTORY AND BACKGROUND

In 1994, PDSI proposed the Safford Land Exchange with the Bureau of Land Management (BLM) for the purpose of consolidating PDSI's property holdings in the Safford Mining District. Through the proposed land exchange, PDSI would acquire public lands (referred to as the Selected Lands) within and adjacent to its existing private property in the District in exchange for other lands (the Offered Lands) in southeast Arizona currently owned by PDSI. Initial scoping for the Safford Land Exchange occurred during the fall of 1994.

PROJECT AREA



ARIZONA



KEY

LAND OWNERSHIP

- BLM
- PHELPS DODGE
- STATE
- PRIVATE
- TRIBAL LANDS

SWCA Inc. Environmental Consultants

Scale 0 1 2 3 Miles

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DOS POBRES/SAN JUAN
PROJECT PLAN OF OPERATION
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 1A. PROJECT LOCATION MAP

During this process two separate events occurred; PDSI was made aware of the U.S. Army Corps of Engineers' (COE) likely requirement of an EIS as a component of the COE's public interest review under Section 404 of the Clean Water Act (CWA), and PDSI's understanding of the mine plan improved such that they were able to define the project and development schedule. In response to these events, PDSI submitted an MPO to the BLM in May 1996 pursuant to the General Mining Law of 1872 and its implementing regulations at 43 CFR Section 3800, subpart 3809. This MPO describes the proposed Dos Pobres/San Juan Project.

The Dos Pobres/San Juan Project (the Project) is an integrated mining operation that includes the development of two open pit copper mines with one solution extraction/electrowinning (SX/EW) processing facility and shared infrastructure and support facilities. PDSI is continuing to pursue the land exchange as an alternative to BLM's authorization of the Dos Pobres/San Juan Project MPO.

The Project area is located in Graham County, north of the town of Safford, Arizona (Figure 1A). The District consists of four known, undeveloped porphyry copper deposits (Dos Pobres, San Juan, Lone Star, and Sanchez), all of which are owned or controlled by PDSI.

As a result of PDSI's submittal of an MPO and in light of CWA permitting requirements, the BLM has requested that the COE and the Environmental Protection Agency (EPA) participate as cooperating agencies in the BLM's NEPA review of the mine plan. Because submittal of the Plan of Operations was a significant change in the scope of the original exchange project, the BLM reinitiated the scoping process for the EIS. A Notice of Intent to prepare an EIS was published in the *Federal Register* on July 31, 1996, and public scoping meetings were held on September 5, 10, and 11, 1996, in Safford, Tucson, and Phoenix, Arizona, respectively. The scoping period closed on October 12, 1996.

1.3. Purpose and Need for the Project

PDSI currently owns land north of Safford, Arizona, containing all of the Dos Pobres copper ore body and portions of a separate copper ore body known as the San Juan deposit. Additionally, PDSI has existing mining claims to the remainder of the San Juan ore body and to public lands surrounding both of these deposits. The proximity of these ore bodies to one another and to the nearby Lone Star and Sanchez copper ore deposits, where PDSI also owns property or has existing mining claims, provides opportunities to combine certain elements of mine infrastructure. The purpose and need for the proposed project is to develop the mineral resources associated with the Dos Pobres and San Juan leachable copper ore deposits as an integrated project using conventional open pit mining and SX/EW technologies to meet a continuing demand for copper.

1.4. Project Area Description

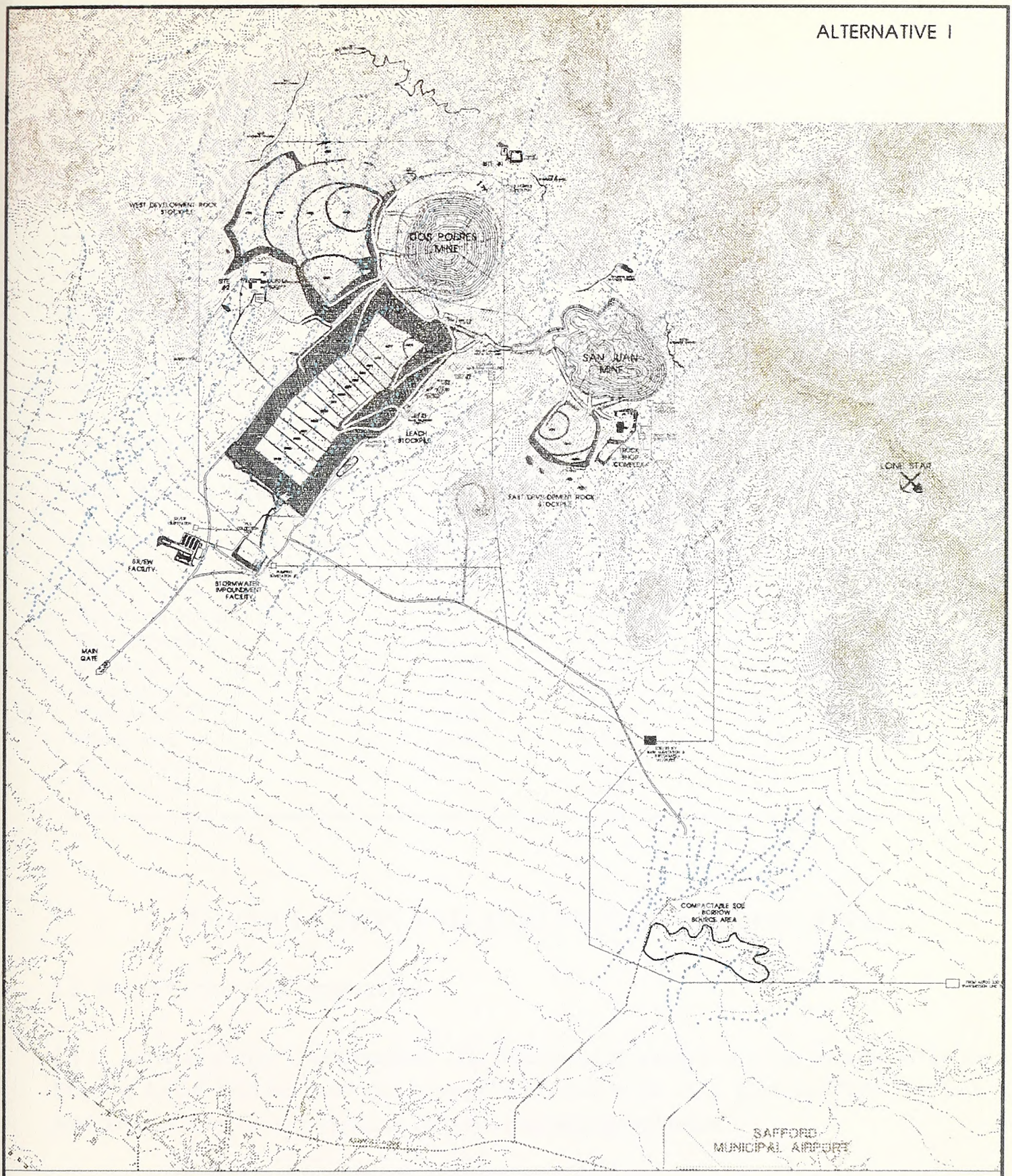
The proposed Dos Pobres and San Juan mine pits are located approximately 7 to 8 miles north of the Gila River near Safford, Arizona, at an elevation of approximately 4,100 ft. Above mean sea level (amsl) in the foothills of the Gila Mountains (Figure 1A). The ridge line of the Gila Mountains, at its closest point to the mine pits, rises to an elevation of approximately 6,050 ft. amsl at Weber Peak approximately 2.5 and 1.5 miles east of the Dos Pobres and San Juan pits, respectively.

Between the proposed mine site and the Gila River is a broad gently sloping plain. Vegetation in the uplands of this area is characteristic of Sonoran Desertscrub habitats and is dominated by broad creosote flats. As the project area increases in elevation towards the Gila Mountains, upland vegetation communities gradually transition to Semidesert Grassland Habitat types.

Drainage patterns in the project area are characterized in many places by braided channel systems or sheet flow and in other areas drainage patterns are dendritic. All of the drainages in the project area are ephemeral washes and the major drainages report to the Gila River just north of Safford. The primary drainages within the project area, from east to west, are Wilson Wash, Peterson Wash, Cottonwood Wash, Talley Wash, Watson Wash, and Coyote Wash. Figure 1B depicts the distribution of Waters of the United States in relation to PDSI's preferred alternative, Alternative I. In the vicinity of the project area there are three springs, Cottonwood, Hackberry, and Bryce Springs, and one small seep referred to as DP Seep. The springs are outside of the foot prints of disturbance for the proposed project, while DP Seep is within the footprint of the proposed Dos Pobres pit.

Xeroriparian vegetation in the project area is generally open and patchily distributed. As is typical with xeroriparian vegetation, most of the plant species present also occur in upland habitats, though in xeroriparian habitats they typically occur at higher densities and/or generally in larger sizes. Total vegetation volume (TVV) in washes in the project area typically ranges from 0.25 to 0.65 m^3/m^2 and averages approximately 0.45 m^3/m^2. In comparison, upland habitats on this property have vegetation volume of from 0.1 to 0.33 m^3/m^2 and averaged approximately 0.25 m^3/m^2.[2] Xeroriparian areas have been qualitatively assigned to three categories based upon apparent channel width identified from available aerial photography. Category 1 xeroriparian areas, the widest channels, supported the lowest vegetation volumes (0.31 m^3/m^2). Average vegetation volume in category 2, intermediate channel widths, and category 3, the narrowest channel widths, supported nearly identical amounts of vegetation (0.46 m^3/m^2 and 0.47 m^3/m^2,

[2] For comparison, well vegetated upland Sonoran Desert Scrub habitat in Northwest Tucson will typically have TVV slightly greater than 0.5 m^3/m^2; Mesquite Bosques typically exceed 1.5 m^3/m^2 and mature Cottonwood/Willow riparian habitats typically exceed 3.0 m^3/m^2.



KEY

WATERS OF THE UNITED STATES POINT LOCATION

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Scale

0 3,000 6,000

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SWCA Inc. Environmental Consultants

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DOS POBRES/SAN JUAN
PROJECT PLAN OF OPERATION
ENVIRONMENTAL IMPACT STATEMENT

FIGURE 1B. DISTRIBUTION OF WATERS OF THE UNITED STATES IN RELATION TO ALTERNATIVE I.

respectively). Creosotebush, not normally considered to be a riparian plant, comprised 30.4%, 23.0%, and 33.9% of the total vegetation volume in category 1, 2, and 3 xeroriparian areas, respectively. Other dominant plant species in the xeroriparian habitats that occur within the project area included catclaw acacia, mesquite, blue paloverde, whitethorn acacia, and burroweed.

Table 1. Dominant Plant Species Within Xeroriparian Habitats and Adjacent Upland Habitats in the Project Area.

	Category 1	Category 2	Category 3	Category 4
No. Transects	21	61	92	36
No. Points	702	894	629	720
No. Washes or Areas	5	11	13	9
Mean Width (m)	66.8	29.4	13.6	na
Mean Vegetation Volume	0.31	0.46	0.47	0.24
		Percent Dominance		
Creosotebush	30.4%	23.0%	33.9%	63.3%
Mesquite	11.3%	22.0%	4.8%	1.2%
Catclaw Acacia	14.3%	21.4%	10.1%	0.7%
Whitethorn Acacia	5.1%	4.4%	20.7%	0.6%
Blue Paloverde	8.7%	6.5%	10.1%	0.8%
Burroweed	14.1%	4.1%	2.8%	0.6%
Desert Broom	6.7%	2.9%	0.6%	0.0%
Snake Weed	1.3%	2.3%	3.2%	3.7%
Prickly Pear	0.0%	0.0%	< 0.1%	5.6%
Perennial Grasses	1.0%	4.0%	7.1%	16.5%
All Other Species	7.1%	9.4%	6.7%	7.0%

2. FORMULATION AND ANALYSIS OF ALTERNATIVES

2.1. FORMULATION OF ALTERNATIVES

2.1.1. General Mining Considerations. The formulation of alternatives to the proposed MPO (the Proposed Action) has been based upon information provided by the COE, BLM, and PDSI. The basic premises underlying the formulation of alternatives are summarized below.

The formulation of alternatives is consistent with typical mine planning approaches. PDSI, in proposing a leach operation for an open pit oxide copper mine, has already determined that an underground mine or *in situ* leach operation is not practicable and that the mineralogical characteristics of the leachable ore

deposits make other extraction and processing techniques, such as concentrating and smelting, inappropriate.[3]

In practice, the formulation of alternative mine development scenarios for an open pit copper mine starts with pit location and design considerations, followed by the identification of suitable locations for development rock stockpiles, leachable ore stockpiles, and associated shops and other facilities, etc. Pit size and configuration are based upon a number of criteria, including: 1) the nature and extent of the economic ore body as determined by projected future copper prices, projected capital and operating expenses, and corporate decisions regarding acceptable levels of risk; and 2) pit stability considerations which determine setbacks and pit wall slopes necessary to achieve stable slopes and desired safety standards. Once the pit size and volumes of overburden, development rock, and ore have been defined, mine engineers then can identify suitable storage locations for overburden and development rock and acceptable locations for leach stockpiles and other facilities. The siting and sizing of leach stockpiles and development rock stockpiles are then based upon a variety of technical, logistic, economic, and environmental considerations. The formulation of alternatives in this analysis follows this general approach.

PDSI has formulated alternatives for the Dos Pobres/San Juan Project based upon the mine planning approach outlined above. The development of leachable ore reserves within the Dos Pobres and San Juan pits will result in a fixed volume of material (development rock and ore) that must be dealt with in a manner that achieves the Project's overall purpose and need and is practicable, as defined by 404(b)(1) criteria.

The placement of development rock stockpiles and leach stockpiles relative to the pit is not completely independent of one another (i.e., a leach stockpile cannot be placed in the same location as a development rock stockpile and haul roads for both types of facilities cannot cross active leach facilities, etc.), therefore, this alternatives analysis treats the pits, leach facilities, and development rock stockpiles as interdependent units. Each interdependent unit is referred to in this document as a configuration alternative.

In addition to configuration alternatives, this analysis also investigates alternative mine locations, and alternatives associated with the placement of the SX/EW facility and the source for compactible soils for the leach stockpile liner system.

[3] The Dos Pobres/San Juan Project Plan of Operations is a mine for leach operation for an open pit oxide copper mine. Concentrating sulfide copper ore could become feasible in the later years of the mine life at Dos Pobres.

The Sanchez and Lone Star copper deposits are identified as sequencing alternatives within the Project. PD considers both deposits as alternatives to the sequencing of mine development activities within the Safford District and not exclusionary alternatives to the Dos Pobres/ San Juan Project. The evaluation of any mine property owned by PDSI, or potentially acquirable by PDSI, in an alternatives analysis would be an analysis or sequence of alternatives, not exclusionary alternatives (such as mine configuration alternatives). Considering the nature of PDSI's business and current and potential future demands for copper products, any ore body controlled by PDSI is subject to development if it proves to be economically, technically, and logistically practicable.

2.1.2. Geographic Considerations. The geographic range of alternatives considered in this analysis is based upon the project's purpose and need (Section 1.3) and has been further constrained by economics and logistics of materials transport (Figure 2) and ownership or controlling interest in copper ore bodies in the region by PDSI. These geographical constraints are briefly discussed below.

The area initially considered suitable for evaluation of configuration alternatives is bounded by major topographic and/or geographic features of the region. The southern boundary is the Gila River, the eastern boundary is the Gila Box Riparian National Conservation Area and Bonita Creek, and the boundary of the San Carlos Apache Reservation defines the northern boundary.

Whereas no topographic feature or legal boundary constrains the mine plan area to the west, cost considerations for haulage distance limit the western extent of the geographic area for alternatives. Identification of suitable sites for placement of development rock and for construction of leach stockpiles is further constrained by the Gila Mountains because of the effects upon haulage costs. The relationship between haulage distance and cost also creates economic constraints that ultimately affect an alternative's practicability.

Figure 2 depicts two 2.5 mile radius circles, each centered on the approximate center of the Dos Pobres and San Juan pits. As a general rule, it is not economic to transport rock material for the project more than 2.5 miles from the pit, although some material may be hauled beyond this distance.[4] Placement of development rock or leach stockpile facilities farther than 2.5 miles from the mine is logistically and economically impractical.

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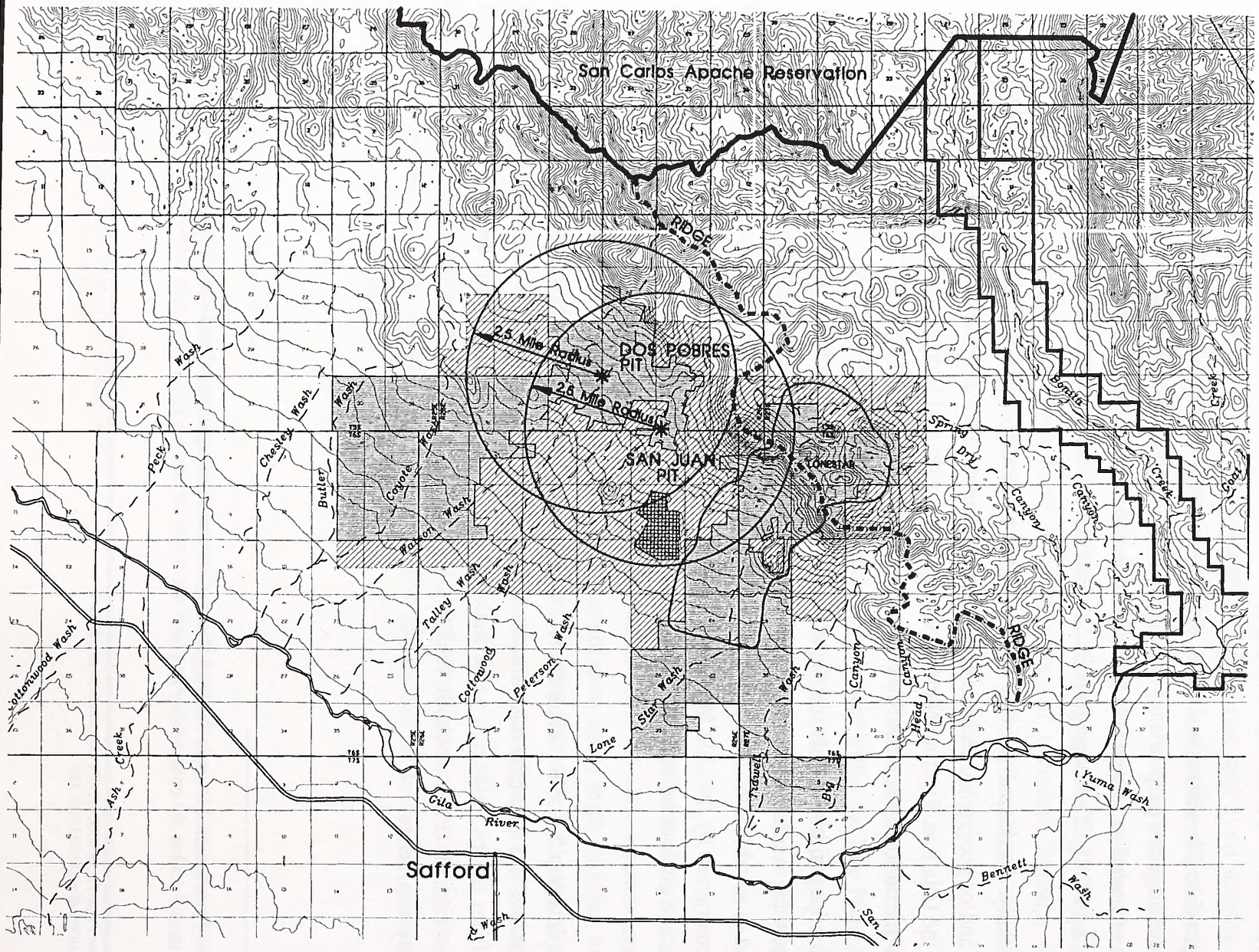
[4] At PD's Morenci Mine in Greenlee County, Arizona, the longest haul distance is approximately 3 miles from the pit and most haul distances are considerably shorter.



QUADRANGLE LOCATION

KEY

- SELECTED LANDS
- PD OWNED LAND
- MELODY CLAIM GROUP
- GILA BOX RIPARIAN NATIONAL CONSERVATION AREA
- SAN CARLOS APACHE RESERVATION

Scale

0 1.5 3

MILES

Sources:
Hydrography – USGS 1:100,000 scale DLG
Transportation – USGS 1:100,000 scale DLG
Contour Lines– Derived from USGS 1:250,000 scale DEM contours produced by Sylvan Ascent, Inc.
CO/MAPS Santa Fe, New Mexico.

SWCA Inc. Environmental Consultants

JOB NUMBER	DRAWN BY KAD	DATE 1-31-97
FILE NAME: CADA C:\ACAD11\SAFFORD\SAF_JIM2.DWG	CHECKED BY DG	REV. DATE

DOS POBRES/SAN JUAN PROJECT PLAN OF OPERATION ENVIRONMENTAL IMPACT STATEMENT

FIGURE 2. GEOGRAPHIC EXTENT OF STUDY AREA

2.2. Practicability Criteria

An alternative is deemed practicable if it is "available and capable of being implemented after taking into consideration existing technology, logistics, and economics in light of overall project purpose" (33 CFR §332-330). This section identifies the specific criteria used to evaluate the practicability of the configuration alternatives to the Dos Pobres/San Juan Project.

2.2.1. Land Position. The presence of mining claims controlled by parties other than PDSI and non-PDSI patented lands within the District is a logistical constraint that limits the possible locations of facilities. The Melody Claims located in Sections 11 and 14 of T6S, R26E, are controlled by multiple entities other than PDSI. Negotiations for PDSI's purchase of the claims have, to date, been unsuccessful. PDSI is also negotiating to purchase the patented Horseshoe Mine property located in Sections 8 and 17 of T6S, R27E. As long as these claims or private lands are controlled by others, these lands are not available for placement of mine-related facilities.

2.2.2. Interference with Development of Other Ore Reserves. PDSI has identified sulfide ore milling reserves beneath the portion of the Dos Pobres oxide ore body currently proposed for mining. PDSI has also partially defined a copper deposit at Lone Star. While development of the Dos Pobres sulfide reserves or the Lone Star deposit is not part of the current proposed project, mine plans for Dos Pobres and San Juan that significantly restrict or limit the ability of PDSI to develop these resources in the future are not practicable.

2.2.3. Capable of Development within Reasonable Time Frames. For an alternative to be practicable and meet the purpose and need for the project, there must be sufficient information available to 1) document with reasonable levels of certainty the economic viability of the alternative, and 2) demonstrate the logistic and technical feasibility of the development effort. Alternatives that would require temporally extensive (five or more years) exploration or technical feasibility evaluations were considered logistically impractical.

2.2.4. Stockpile Capacity Provides Storage Buffer. Mine feasibility drilling data are based upon exploration drill holes placed on approximately 400 foot centers. At this level of resolution it is likely that the reserves identified will either increase or decrease as more detailed information is generated once mining activities begin. Stockpile facilities must be able to efficiently accommodate a reasonable volume of additional material without significantly decreasing leach facility efficiencies. Alternatives which do not provide sufficient storage capacity to allow for potential increases in the volume of ore present in the

current MPO could logistically impinge upon the development of the ore body. All alternatives were evaluated for economic consideration as well as reasonable time frame considerations.

2.2.5. Economic Consideration. As a publicly held corporation, PDSI has a fiduciary responsibility to its stock holders to provide a reasonable return on investment balanced against the risks associated with achieving those returns. PDSI, after developing the range of alternatives presented in this Analysis, projected capital and operating costs through the life of mine for each alternative. These costs and the cash flow associated with them were then evaluated by PDSI using internal rate of return (IRR) and net present value (NPV). The (IRR) and (NPV) are typical standards for measuring the economic viability of a project. They measure the ability of the income from the project to repay the capital investment and to provide a reasonable return on that investment. IRR is that discount rate which equates the present value of a project's expected cash inflows to the present value of a project's expected cost. NPV is the sum of all project costs and income discounted at the project's cost of capital. The discount rate is the cost of capital, either assumed or actual, for the project and present value is the current worth of an amount of money to be paid at some future date based upon an assumed discount rate.

Based on the risk associated with development of a project of this type, specifically fluctuating copper prices in the world copper market, estimated leach recoveries and minable reserves, and increasing competition from low cost producers, internal PDSI screening criteria were used to determine the economic viability of alternatives. From a valuation perspective, the parameters used for internal screening are supported in industry and investment communities to measure an acceptable rate of return for mining investments in prefeasibility and feasibility planning. Economic data are considered privileged and confidential considering the effect such information can have on PDSI's competitive abilities within the market. Economic information utilized to complete this assessment was provided to the Corps of Engineers under separate cover.

2.3. Configuration Alternatives Description and Practicability Determination

Each of the nine configuration and two location alternatives considered are briefly described below. Following each description is a discussion of each alternative's practicability. Table 2 summarizes the key differences between each of these alternatives.

2.3.1. Alternative A: Two Leach stockpiles. This alternative (Figure 3) is the original MPO submitted by PDSI to the BLM in May 1996. Development of Alternative A includes two leach stockpiles, one located to the south of the Dos Pobres pit and one to the south of the San Juan pit. This alternative is strictly a run-of-mine (ROM) operation which does not include crushing of the leach material. Oxide ore

in each pit would be mined year-round using conventional drill and blast techniques. After blasting, run-of-mine sized ore from each pit would be loaded by shovels onto haul trucks, which would transport the ore to separate, lined leach stockpiles located south-southwest of each pit. At completion, the roughly 716-acre Dos Pobres pad would be approximately 400 feet high, with about sixteen 25-foot high lifts. The average slope of the sides of the leach stockpile will be 2H:1V. The San Juan pad would cover approximately 634 acres, with the same height, number of lifts, and slopes as the Dos Pobres pad.

Down-gradient (south) of each leach stockpile would be a pregnant leach solution (PLS) collection tank and a stormwater impoundment/overflow pond. PLS would be pumped via pipelines from each tank for processing at a shared SX/EW facility, which would be located on PDSI property.

The Dos Pobres pit, which is located entirely on PDSI property, is nearly circular in shape with a diameter of approximately 4,200 feet, a maximum depth of 1,400 feet below the surface elevation, and a surface area of roughly 319 acres. Surrounding the Dos Pobres pit is an approximately 1,300-foot setback in which no leach or development rock stockpiles or other facilities would be located. This setback has been designed primarily to allow for potential future mining of the deeper sulfide milling reserves that underlie the leachable ore at Dos Pobres. The San Juan pit, which would be located in part on PDSI private land as well as BLM lands, is roughly oval in shape, with a maximum diameter of approximately 5,200 feet, a maximum pit depth of about 1,000 feet below surface elevation, and a surface area of about 323 acres.

Development rock, consisting of low grade and unmineralized rock, would be removed from the pits and stockpiled within unlined facilities adjacent to the Dos Pobres mine. One development rock stockpile would be located west and one east of the Dos Pobres pit and together would cover a total of approximately 782 acres.

Practicability Determination: This alternative is not practicable as a result of land use conflicts between the originally proposed MPO and the Melody Claim group which is controlled by others. Resizing the San Juan Leach facility to avoid the Melody Claim group would have a significant adverse effect on project economics due to considerations of scale and capital expense.

2.3.2. Alternative B: Single Leach Stockpile Constructed with a Conveyor/Stacker. Alternative B (Figure 4) would have a single leach stockpile located south-southwest of the Dos Pobres Mine. With this alternative, a crush/convey/stack system would replace a portion of the standard load and haul ore transport methods used in traditional ROM operations. After blasting, ore from each pit would be loaded by shovels onto trucks and most of it hauled to a crushing facility. From the crushing facility a conveying and stacking system would transport and deposit the crushed ore onto a single lined pad located south-southwest of the Dos Pobres pit. The mobile conveyor leading to the stacker requires a shallow slope of

4H:1V on the east side of the stockpile, increasing the required surface area of the pad. The slopes on the remaining sides of the stockpile are designed at a 2H:1V slope.

A 782-acre development rock stockpile would be placed west of the Dos Pobres Mine and another development rock stockpile would be located south of the San Juan Mine which would cover approximately 170 acres.

Practicability Determination: This alternative is not practicable. The feasibility of employing the mobile elevating conveyor concept is technically uncertain, given the fact that there is no current application of this technology at this scale, adding to the economic risk of this alternative. Mobile stacking and conveying systems which place crushed leach material at the planned production rate of 100,000 tons per day have been built. The uncertainty arises from the mobile elevating conveyor which would be used to lift the material to the ultimate 400 ft. stockpile height. A mobile elevating conveyor of this size and configuration has never been built before.

The economics of this alternative fall significantly short of the economic thresholds established to determine practicability due to increased capital costs associated with the mobile elevating and stacking conveyors and additional liner requirements. The IRR and NPV for this alternative are significantly below the established practicability threshold.

2.3.3. Alternative C: Partial Backfill of San Juan. Pit configuration and sizing of this alternative are identical to Alternative A except that the San Juan pit would be partially backfilled with development rock from the San Juan and Dos Pobres Mine (Figure 5). Other features, such as the size and configuration of the Leach Stockpile, are identical to Alternative I. Placing a portion of the development rock in the San Juan pit slightly reduces the height and footprint of the development rock stockpiles located to the west of the Dos Pobres pit and to the south of the San Juan pit. The earliest that partial backfilling of the San Juan pit could begin is estimated to be in Year 10 of the Project since a portion of the San Juan pit must be mined out prior to commencing backfilling activity.

Further opportunity may exist to minimally reduce the footprint of the stockpiles by maintaining the currently planned development rock stockpile height of 400 ft. Mine phasing, the distribution of oxide ore reserves, and the known sulfide ore resource do not provide the opportunity for partial backfill of the Dos Pobres pit.

Practicability Determination: This alternative has been determined to be practicable. This option has a negative economic impact, requiring a longer haulage profile for development rock from the Dos Pobres

pit which is only partially offset by a shorter haulage profile for material from the San Juan pit. This option has no effect on the leach stockpile configuration.

Execution of this alternative would result in an IRR and NPV only slightly below established practicability thresholds. While IRR and NPV are slightly below threshold levels, considering the variability among cost estimating factors utilized for economic analysis, this alternative is considered practicable.

2.3.4. Alternative D: Reduced San Juan Pit. The Dos Pobres pit would be excavated as described in Alternative A. A portion of the San Juan ore body (approximately 31%) would remain undeveloped to avoid disturbing portions of Peterson Wash (Figure 6). Approximately 69 percent of the ore reserves within San Juan would be mined. Under this alternative, development rock stockpiles and other mine facilities would be identical to those described in Alternative I. The leach stockpile, which would be located as in Alternative I, would be constructed with similar slopes and methods but would be approximately 137 acres smaller.

Practicability Determination: This alternative is not practicable. Restriction of mining activity in the area of Peterson Wash results in a 31 percent decrease in the San Juan pit's minable ore reserve. While this option would result in decreased impacts to jurisdictional waters (ca. 2.21 acres when compared to Alternative I) it has a significant negative impact on project economics and does not allow Phelps Dodge to fully develop the San Juan resource to its economic limits. This alternative results in an IRR and NPV that are considerably below established practicability thresholds.

2.3.5. Alternative E: Dos Pobres Mine Only. Under this alternative, only the Dos Pobres ore body would be mined (Figure 7). The San Juan pit, and associated development rock stockpiles would not be developed. Development of the Dos Pobres ore body would proceed as described in Alternative A. The leach stockpile would be approximately 268 acres smaller than the Alternative I configuration but otherwise would be constructed in a manner similar to that described for Alternative I.

Practicability Determination: This alternative is not economically practicable. Alternative E limits mining to only the Dos Pobres ore body which reduces the leachable reserves by approximately 53 percent. The relatively high stripping ratio at Dos Pobres compared to San Juan, and loss of economic synergies created by the proximity of the Dos Pobres and San Juan ore bodies has significant adverse affects upon mine economics. The IRR and NPV are appreciably below established practicability thresholds.

2.3.6. Alternative F: San Juan Mine Only. Under this alternative only the San Juan ore body would be developed (Figure 8). All production operations would be identical to those described for the San Juan mine in Alternative I, except the Dos Pobres mine and development rock stockpiles would not be

constructed. For this alternative the leach stockpile was located similarly to the other alternatives because of the position of the Melody Claim group.

Practicability Determination: This alternative is not economically practicable. Alternative F limits mining to only the San Juan deposit and reduces the leachable reserve by approximately 47 percent. The reduced capital expenditures associated with a San Juan only project would not offset the lost economic synergies that result from excluding the proximity of the Dos Pobres ore body. This reduction would result in a significantly decreased internal rate of return and net present value that are well below the established practicability thresholds.

2.3.7. Alternative G: No Set Back at Dos Pobres. Under this alternative, the 1,300-foot setback around the Dos Pobres pit included in all other Dos Pobres Mine alternatives would not be provided (Figure 9). Other aspects of the mine would be similar to those proposed for Alternative I.

Practicability Determination: This alternative is not logistically practicable. A setback of approximately 1,300 feet between Dos Pobres pit limits and the edge of the stockpiles enables future development of the sulfide milling reserves located beneath the leachable ore reserves. The decision to develop the sulfide reserves may be made by Year 5 of the Dos Pobres/San Juan Project life, after completion of engineering and economic feasibility analysis.

While eliminating this setback improves Dos Pobres/San Juan Project economics through decreased haulage costs, it does little to reduce impacts to jurisdictional waters of the U.S. Furthermore, it is not prudent to place stockpiles on top of a known resource if development of that resource would require removal and relocation of those stockpiles.

2.3.8. Alternative H: A Single 700-Foot High Leach Pad. Consideration was given to increasing the leach stockpile height in order to reduce the pad footprint and reduce impacts to waters of the United States. This alternative is identical to Alternative I except for the height (700 feet) and area (approximately 676 acres) of the leach pad.

Practicability Determination: Construction of a 700 ft. high leach pad would present several logistical problems from an operational standpoint and would result in insufficient top-of-pad surface area to optimize leach operations. After Year 8 of the project, leach recovery values would be significantly reduced for the remaining eight years of the project. The leach parameters adversely affected by this modification include leach cycle time, lift height, and solution flow rates. Additionally, the 700 ft. pad height would not provide storage for any additional leachable ore which might be encountered once mining commences. Not allowing for the potential for increased leachable reserves within the single pad configuration may

result in the need to construct an additional leach pad(s) and associated facilities, including PLS collection facilities and stormwater impoundment structures. An economic analysis was not prepared for this logistically impractical alternative.

2.3.9. Alternative I: Single Reduced Leach Pad/Crush Convey/Haul Truck Placement (PDSI's Preferred Alternative). In developing PDSI's preferred alternative, the mobile elevating conveyor/stacker system proposed in Alternative B was compared to conventional placement using haulage trucks. Alternative I (Figure 10), uses conventional truck haulage for placement of crushed ore. This Alternative, Alternative I, results in reduced surface area requirements (ca. 316 acres less than Alternative B) and reduced impacts to Jurisdictional Waters (ca. 3.68 acres less than Alternative B). Reduced surface area impacts result from increasing the 4H:1V slope on the east side of the leach pad to 2H:1V. All other facilities would be as described for Alternative B.

Planning the leach pad for a 400-450 ft. height will allow for potential increases to the minable reserve which are possible given the confidence level on leach material recovery estimates and reserve definition based on current leach column test work and exploration drilling information.

Practicability Determination: This alternative is considered practicable. The single leach pad configuration was chosen based on the reduced impacts to jurisdictional waters of the U.S. and decreased capital requirements of material handling, PLS collection, and stormwater containment facilities when compared to Alternatives A and B. Economic information regarding the internal rate of return and the net present value of the cash flow associated with this alternative meets or exceeds the established economic practicability criteria.

2.3.10. Alternative J: Develop Sanchez Mine First. Under this alternative, PDSI would implement mining operations authorized in the final Sanchez Copper Mine Plan of Operations EIS (Figure 11) prior to development of the Dos Pobres/San Juan Project. PDSI acquired the Arizona Copper Company's (AZCO) interest in the Sanchez project in late 1995. The Sanchez mine would be constructed on approximately 1,400 acres of BLM administered public land. The anticipated life of the mine is approximately 17 years.

The Sanchez pit would be approximately 277 acres, with a maximum pit depth of approximately 1,200 feet below the surface elevation. Under the current mine plan, production operations facilities would include a single leach stockpile (484 acres) and SX/EW plant, and three development rock stockpiles covering approximately 487 acres.

Practicability Determination: This alternative is not practicable. Although the Sanchez mine currently has an approved MPO, development of the mine prior to Dos Pobres and San Juan would not be practicable based on PDSI's existing knowledge of the deposit. The existing technical data regarding metallurgical characterization and ore body description are incomplete and certain aspects of engineering design, including plant design and size, need further evaluation.

At this time PDSI is in the process of verifying the information collected by the AZCO and other prior owners of the Sanchez Mine. The collection of this information involves an exploration drilling program designed to confirm the nature and extent of the resource. Concurrently, the samples collected from prior exploration of the property are being re-assayed to verify existing information and gather further information relevant to evaluating the deposit. Following completion of reserve verification, a new geologic block model will be constructed in a manner consistent with the methods utilized at Dos Pobres and San Juan. A series of metallurgical tests must be completed to determine the leachable characteristics of the various ore types defined by this block model.

In addition, studies are required to evaluate potential inflow of water to the pit from the Gila River. Based upon PDSI's current understanding of regional hydrology, they believe that development of the pit without safeguards to limit pit water inflow could have adverse impacts to Gila River riparian habitats and aboriginal water rights. PDSI's ongoing technical and economic evaluation of this property are, in part, focused on the resolution of these problems. Should technically and logistically viable solutions to water infiltration into the Sanchez mine be developed, PDSI would consider this property practicable, as defined by the 404(b)(1) guidelines, and will actively pursue mine development efforts.

This type of evaluation is typical of the procedure PDSI and other mining companies follow to minimize the risk of developing a property that lacks historical operating information, such as Sanchez. This evaluation program is expected to be completed over the next two to three years. Following completion of this program, pre-feasibility and feasibility studies will be conducted by PDSI to assess the economic potential of developing the Sanchez property in conjunction with PDSI's other Safford Mining District resources.

2.3.11. Alternative K: Develop Lone Star. This alternative would involve developing the Lone Star mineralized deposit prior to development of the Dos Pobres/San Juan Project. Because geologic exploration studies are still ongoing to characterize the ore body and determine its extent, this alternative is only conceptual at this time. However, preliminary exploration by PDSI of the Lone Star deposit indicate that it contains an estimated 1.6 billion tons of leachable ore. The mine would be a leach operation similar to Dos Pobres/San Juan, with one pit, leach stockpile facilities, and development rock stockpiles. The Lone Star resource is the least explored and understood resource in the Safford Mining District. The

Lone Star resource currently does not have sufficient exploration drilling to fully define the nature and extent of the ore body. The extent of conceptual foreseeable uses, as currently understood, is depicted in Figure 12. This development is independent of PDSI operations at the Dos Pobres/San Juan project.

Practicability Determination: Development of this alternative is not practicable at this time due to the limited information available upon which to prepare a mine plan and determine project feasibility. Additional exploration drilling and leach recovery test work is expected to take place during the next two to three years prior to commencing mine planning and economic analysis. At that time, a pre-feasibility study will be completed to determine the economic viability of the project. Pending completion of resource evaluation, test work, and favorable economic results from the pre-feasibility study, permitting activity could be initiated in four to five years. Assuming a two to three year-permitting schedule, this could allow for mining activity to commence at Lone Star in six to eight years.

2.4. Compactible Soil Borrow Source Alternative Description and Practicability Determination

In the course of evaluating alternative mine configurations and developing the liner design, two alternative sources of compactible soils were identified. These sources are known as the Lone Star and Watson Wash/Reduced Lone Star Compactible Soil Borrow Areas. Each of these is discussed below. Graphic presentation of these compactible soil borrow alternatives is provided in the context of the proposed Dos Pobres/San Juan Project Plan of Operations which is referred to as Alternative I — *Single Reduced Leach Pad/Crush Convey/Haul Truck Placement* in this alternatives analysis.

Approximately 1.5 to 2 million cubic yards of compactible soil will be required for liner construction. This range reflects the range of material types being considered and compaction ratios associated with each.

2.4.1. Lone Star Compactible Soil Borrow Source. The Lone Star Compactible Soil Borrow Source (LSBS) is located in Sec. 23 T6S, R26E, (Figure 13). This site is approximately 4.5 miles southeast of the Alternative I leach pad facility. Material would be transported by truck to the Leach Stockpile along an approximately 70-foot wide roadway constructed for that purpose. The roadway would be constructed with 40 by 100-foot turnouts spaced at approximately 1,000 foot intervals.

The compactible soil material to be mined is approximately 10 feet below the surface and the total excavation depth will be approximately 50 feet. The compactible soil in LSBS is clay from an old lake bed deposit. It is relatively homogeneous, with only occasional layers of fine sand or low plasticity clay and silt. The clay in this deposit is generally stiff and dry to lightly moist. Overburden from the borrow area

will be deposited to the west of the borrow area. The total surface disturbance of this site will be approximately 311 acres (226 acres of borrow pit and 45 acres of overburden disposal area, and ca 40 acres for the haul road).

Practicability Determination: This alternative is logistically, technically, and economically practicable.

2.4.2. Watson Wash/Reduced Lone Star Compactible Soil Borrow Source Alternative. The Watson Wash Compactible Soil Borrow Source (WWBS) is located in portions of Sections 4,5,8, and 9 of T6S, R6E (Figure 13) and would be utilized in conjunction with a reduced LSBS. This site is located almost entirely below the southern end of the proposed leach stockpile described in Alternative I. The material to be mined from this site is a basin fill material, characterized by surface lying rock overlying a shallow depth (2-3 feet) of silty clay intermixed with volcanic gravel and cobble fractions with occasional boulders. Underlying this layer is a less weathered material characterized by slightly to strongly cemented silty gravel with caliche.

During the course of grubbing and clearing operations at the site, fine materials salvaged from the top 2 to 3 feet of "soil" will be separated to provide material necessary for leach stockpile liner construction. Oversized material will be stockpiled for other uses. The total acreage of disturbance associated with this operation will be 664 acres. Approximately 389 acres of this area is within areas that would be disturbed by development of the leach stockpile facility as proposed in Alternative I. The total area of surface disturbance in addition to disturbance that would occur with implementation of Alternative I would be 275 acres.

The Watson Wash Borrow area will provide approximately half of the compactible soil required for the Alternative I leach stock pile configuration. Additional material needed to construct the remaining portions of the liner design will be obtained from the LSBS location.

Practicability Determination: PDSI has determined that the compactible soil material associated with the Watson Wash site does not meet project needs. The Watson Wash/Reduced Lone Star Compactible Borrow Source is not practicable.

2.5. SX/EW Plant Location

Two SX/EW plant locations have been evaluated. The East Plant Location is centrally located within the Safford Mining District and would conceivably support future development at Lone Star and possibly the Sanchez project site. The West Plant Location is located adjacent to the Dos Pobres/San Juan Leach

Facility. Each of these two facilities would be configured and sized to satisfy requirements of the proposed Mine Plan of Operations.

2.5.1. East Plant Location. The East Plant Site would be located on PDSI's patented Lone Star property and would provide a centralized location for potential long-term District development (Figure 14). The plant would receive pregnant leach solution (PLS) from a PLS collection tank below the leach stockpile. Stainless steel and HDPE pipelines would transport PLS to the East SX/EW plant location. Plant feed and raffinate pipelines would be constructed along a common corridor approximately four miles long.

The SX plant would include a plant feed pond, mixer-settler tanks, a tank farm, and raffinate tanks and pumping plant. The plant feed tank would provide surge capacity for incoming PLS. Raffinate tanks would provide surge protection for raffinate solution. The electrowinning (EW) tank house would contain 280 electrowinning cells capable of producing upto 250 million pounds of cathode copper per year. The tank farm would be constructed in a concrete-lined containment area that would be excavated and designed to contain any stormwater runoff and process solution overflows from the SX/EW plant. These solutions would be collected in a 1 million gallon stainless steel tank to be constructed within the containment area. The tank farm would also house electrolyte and reagent storage, and process tanks and filter systems.

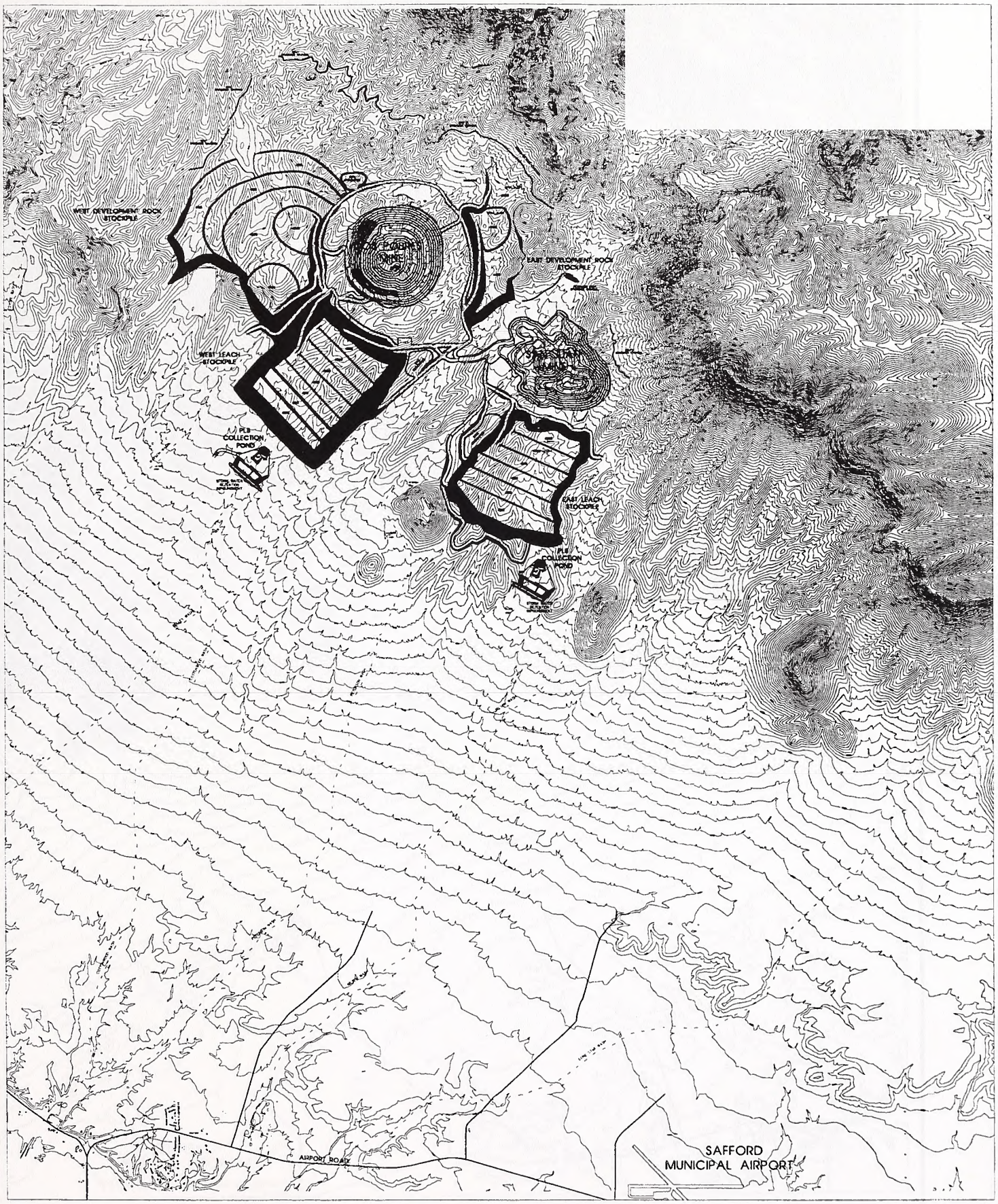
Practicability Determination: This alternative is logistically, economically, and technically practicable.

2.5.2. West Plant Location. The West Plant Site would be located immediately southwest of the Alternative I leach stockpile (Figure 14) in section 8, T6S and R26E. System components and general layout are similar to the East Plant Site, except that the four mile pipeline corridor would not be required.

Practicability Determination: This alternative is logistically, economically, and technically practicable.

Table 2. Configuration and Safford District Location Alternative Characteristics Summary. (Data preliminary and subject to change.)

	Alternatives										
	ALTERNATIVE A Mine Plan of Operations	ALTERNATIVE B Crush Convey/Single Leach Pad	ALTERNATIVE C Crush Convey/Single Leach Pad/Partial Backfill of San Juan Mine	ALTERNATIVE D Crush Convey/Single Leach Pad/Reduced San Juan Mine	ALTERNATIVE E Dos Pobres Only	ALTERNATIVE F San Juan Only	ALTERNATIVE G Crush Convey/Single Leach Pad/No Set Back for Sulfide Pit Limits	ALTERNATIVE H Crush Convey/Single 700' High Leach Pad	ALTERNATIVE I Single Reduced Area Leach Pad	ALTERNATIVE J Develop Sanchez Ore Deposit Prior to DP/SJ	ALTERNATIVE K Develop Lonestar Ore Deposit Prior to DP/SJ
Leachable Ore (KTONS)	626,361	626,361	626,361	526,813	294,986	331,375	626,361	626,361	626,361	191,000	Unknown
Development Rock (KTONS)	384,743	384,743	384,743	367,453	340,645	44,098	384,743	384,743	384,743	200,640	Unknown
Pit Size (Acres)	Dos Pobres: 319 San Juan: 323	Dos Pobres: 319 San Juan: 323	Dos Pobres: 319 San Juan: 323 (215 After Backfill)	Dos Pobres: 319 San Juan: 215	Dos Pobres: 319 San Juan: 0	Dos Pobres: 0 San Juan: 323	Dos Pobres: 319 San Juan: 323	Dos Pobres: 319 San Juan: 323	DosPobres: 319 San Juan: 323	277	Lone Star: Unknown
Pit Bottom Elev./Depth	Dos Pobres 2600/1400 San Juan 3100/1000	Dos Pobres 2600/1400 San Juan 3100/1000	Dos Pobres 2600/1400 San Juan 3100/1000	Dos Pobres 2600/1400 San Juan 3100/1000	2600/1400	3100/1000	Dos Pobres 2600/1400 San Juan 3100/1000	Dos Pobres 2600/1400 San Juan 3100/1000	Dos Pobres 2600/1400 San Juan 3100/1000	Unknown	Unknown
Leach Pad(s) Size (Acres)	Dos Pobres: 656 San Juan: 506	1301	985	799	532	588	985	676	985	484	Unknown
Max Leach Pad Elev. (Feet above msl)	Dos Pobres: 4278 San Juan: 4225	4100	4305	4305	4275	4275	4275	4550	4305	Unknown	Unknown
No. Dev. Rock Stockpile Size (acres)	Dos Pobres:782 San Juan: 256	Dos Pobres:782 San Juan: 170	Backfill: 108 Dos Pobres:782 San Juan: 170	Dos Pobres:744 San Juan: 169	Dos Pobres:782 San Juan: 256	782	256	Dos Pobres: 782 San Juan: 170	Dos Pobres: 782 San Juan: 170	450 33 4	Unknown
Development Rock Stockpile Elevation	West: 4280 East: 4480	West: 4250 San Juan: 4250	West: 4200 San Juan: 4250	West: 4205 San Juan: 4100	4250	4150	West: 4300 San Juan: 4150	West: 4250 San Juan: 4250	West: 4250 San Juan: 4250	Unknown	Unknown
Other Description	Run of mine operation with no crusher facilities: leach stockpile slopes at 2H:1V; this alternative includes a 1300 foot setback at Dos Pobres.	This alternative would use a single leach pad; ore would be placed on the pad as run of mine and some ore would be crushed and placed on the pad with conveyor/stacker system.	Partial backfill of the pit would begin in year 10 of the mine after the western portion of the San Juan pit was mined out. The longer haulage profile for San Juan is only partially offset by the shorter profile for San Juan.	A portion of the San Juan pit would be left undeveloped (ca. 31%) to limit mine activity in the vicinity of Peterson Wash.	This alternative would leave the San Juan reserves unutilized. Leach and development rock stockpiles would be reduced in size accordingly. The setback at the Dos Pobres pit would be retained.	This alternative would leave the Dos Pobres resources unutilized. The leach stockpile would remain in the general location of previous alternatives to avoid placement in Cottonwood and Peterson washes.	The primary difference between this alternative and Alternative I is the elimination of the 1300 foot set back from the Dos Pobres oxide ore body.	This alternative would be similar to Alternative I except for the leach stockpile which would have a smaller footprint.	This alternative is similar to Alternative B except that the conveyor/stacker system would be eliminated and material placed using haul trucks. The leach stockpile would be significantly shorter and would have 2:1 slopes.	Data based upon existing Sanchez MPO	Information available based upon Foreseeable Use Data Production, operation and support areas are 5,835 acres. Transition areas are 523 acres.



Scale

0 3,000 6,000

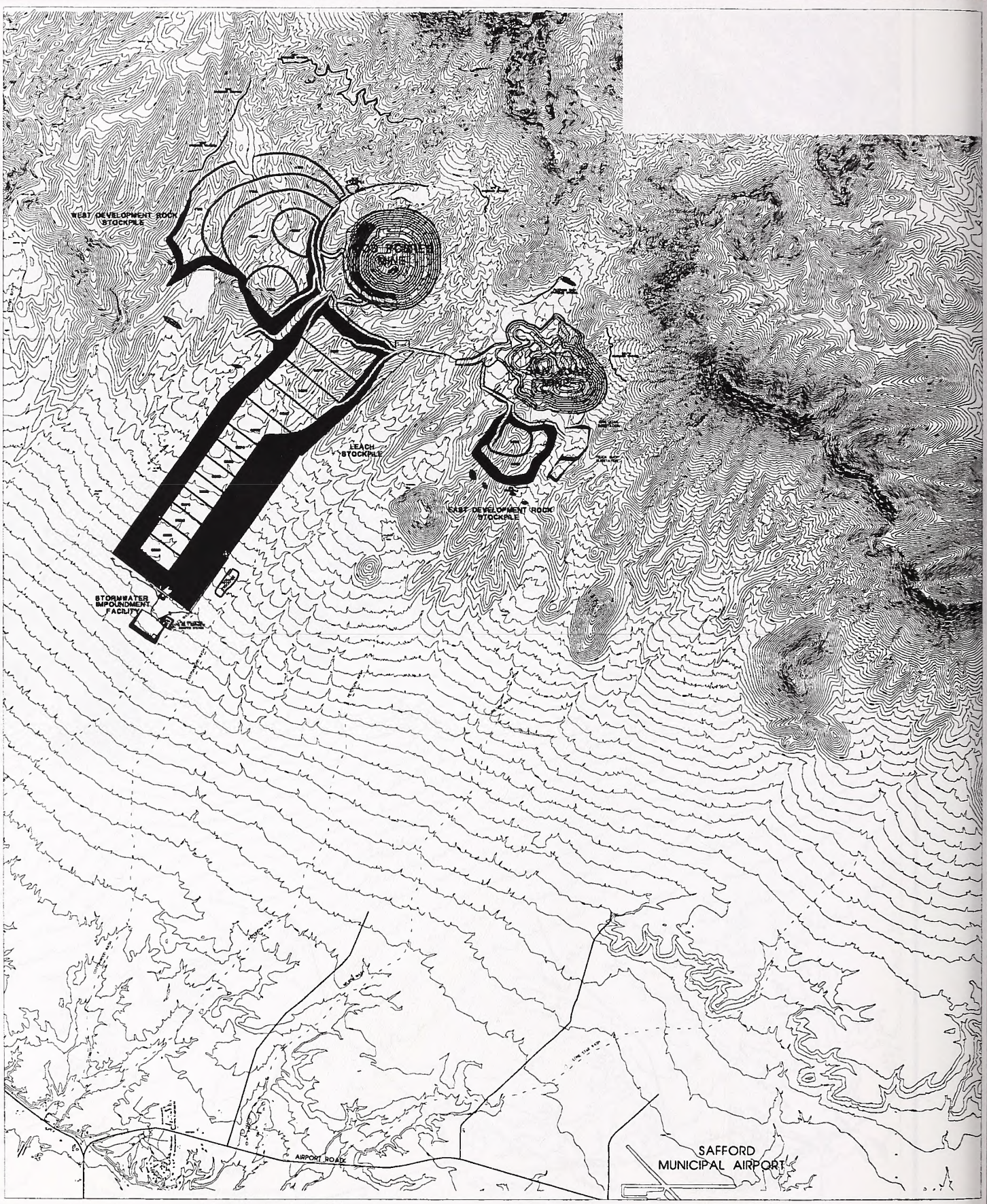
FEET

DOS POBRES/SAN JUAN MPO
CLEAN WATER ACT
404(b)(1) ALTERNATIVES ANALYSIS

FIGURE 3. ALTERNATIVE A: TWO LEACH PAD ALTERNATIVE

SWCA Inc. Environmental Consultants

JOB NUMBER	DRAWN BY	DATE
51-61700	KAD	1-17-97
FILE NAME: CADB C:\ACADD\SAFFORD\NEWMPO\PLOT.DWG	CHECKED BY JT	REV



Scale

0 3,000 6,000

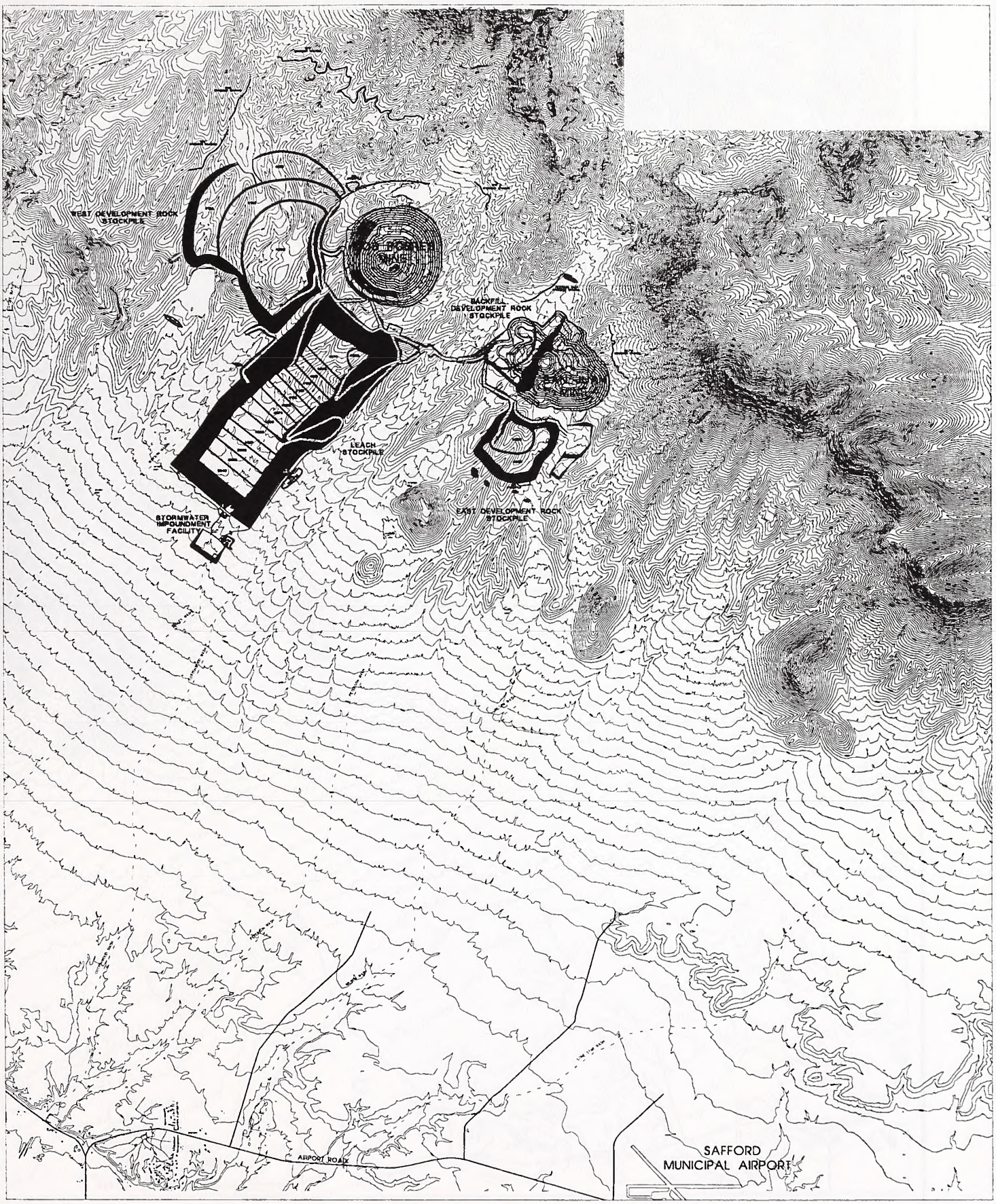
FEET

DOS POBRES/SAN JUAN MPO
CLEAN WATER ACT
404(b)(1) ALTERNATIVES ANALYSIS

FIGURE 4. ALTERNATIVE B: CRUSH/CONVEY/ SINGLE PAD ALTERNATIVE

SWCA Inc. Environmental Consultants

JOB NUMBER 51-61700	DRAWN BY KAD	DATE 1-17-97
FILE NAME: CADB D:\ACAD11\SAFFORD\NEWMPO\PLOT.DWG	CHECKED BY JT	REV



Scale

0 3,000 6,000

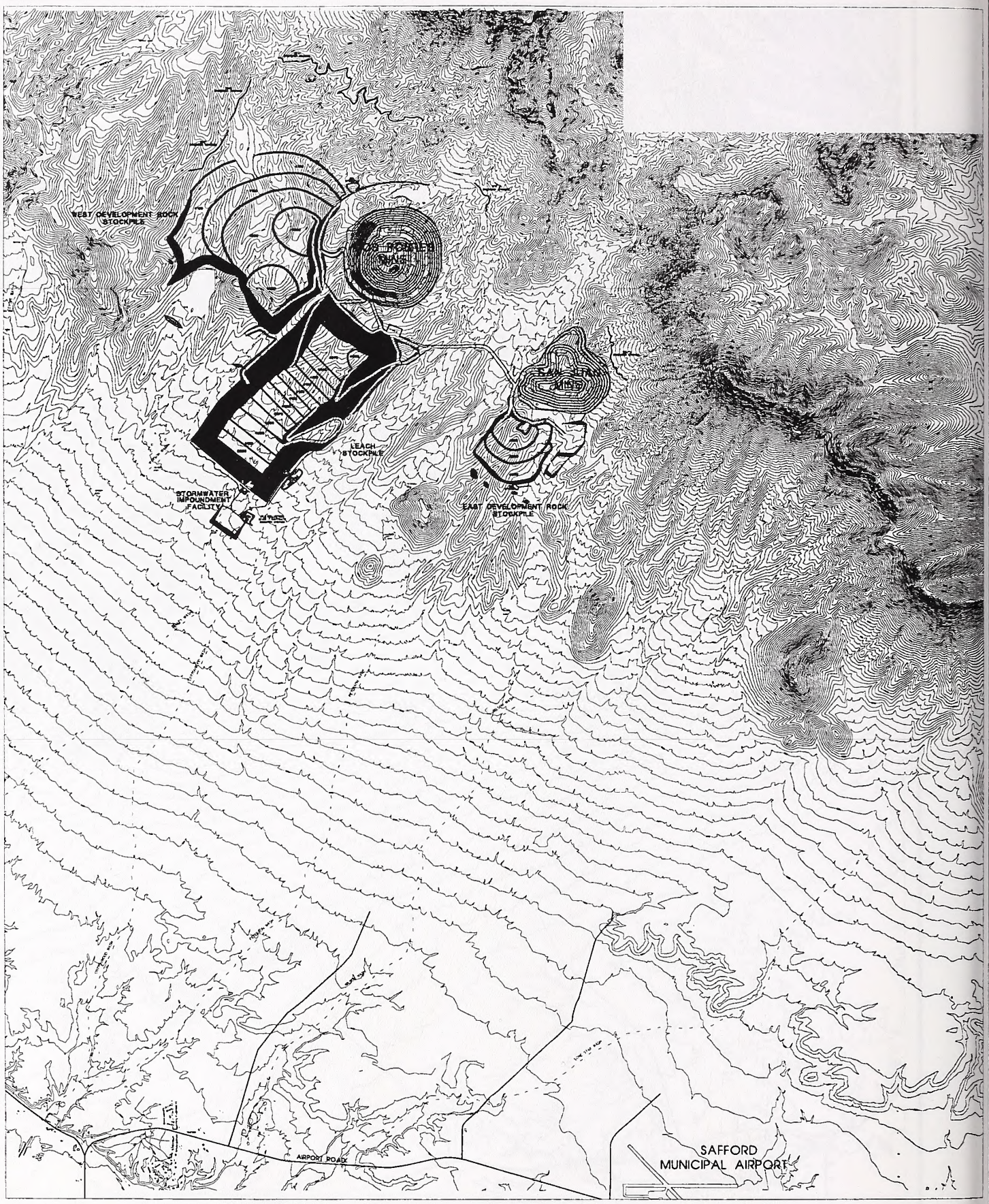
FEET

DOS POBRES/SAN JUAN MPO
CLEAN WATER ACT
404(b)(1) ALTERNATIVES ANALYSIS

FIGURE 5. ALTERNATIVE C: PARTIAL BACKFILL OF SAN JUAN PIT ALTERNATIVE

SWCA Inc. Environmental Consultants

JOB NUMBER 51-61700	DRAWN BY KAD	DATE 1-17-97
FILE NAME: CADS C:\ACAD11\SAFFORD\NEWMPDNPLOT.DWG	CHECKED BY JT	REV



Scale

0 3,000 6,000

FEET

DOS POBRES/SAN JUAN MPO
CLEAN WATER ACT
404(b)(1) ALTERNATIVES ANALYSIS

FIGURE 6. ALTERNATIVE D: REDUCED SAN JUAN PIT ALTERNATIVE

SWCA Inc. Environmental Consultants

JOB NUMBER	DRAWN BY	DATE
51-61700	KAD	1-17-97
FILE NAME: CADB C:\ACAD11\SAFFORD\NEWMPO\PLOT.DWG	CHECKED BY JT	REV.

Scale

0 3,000 6,000

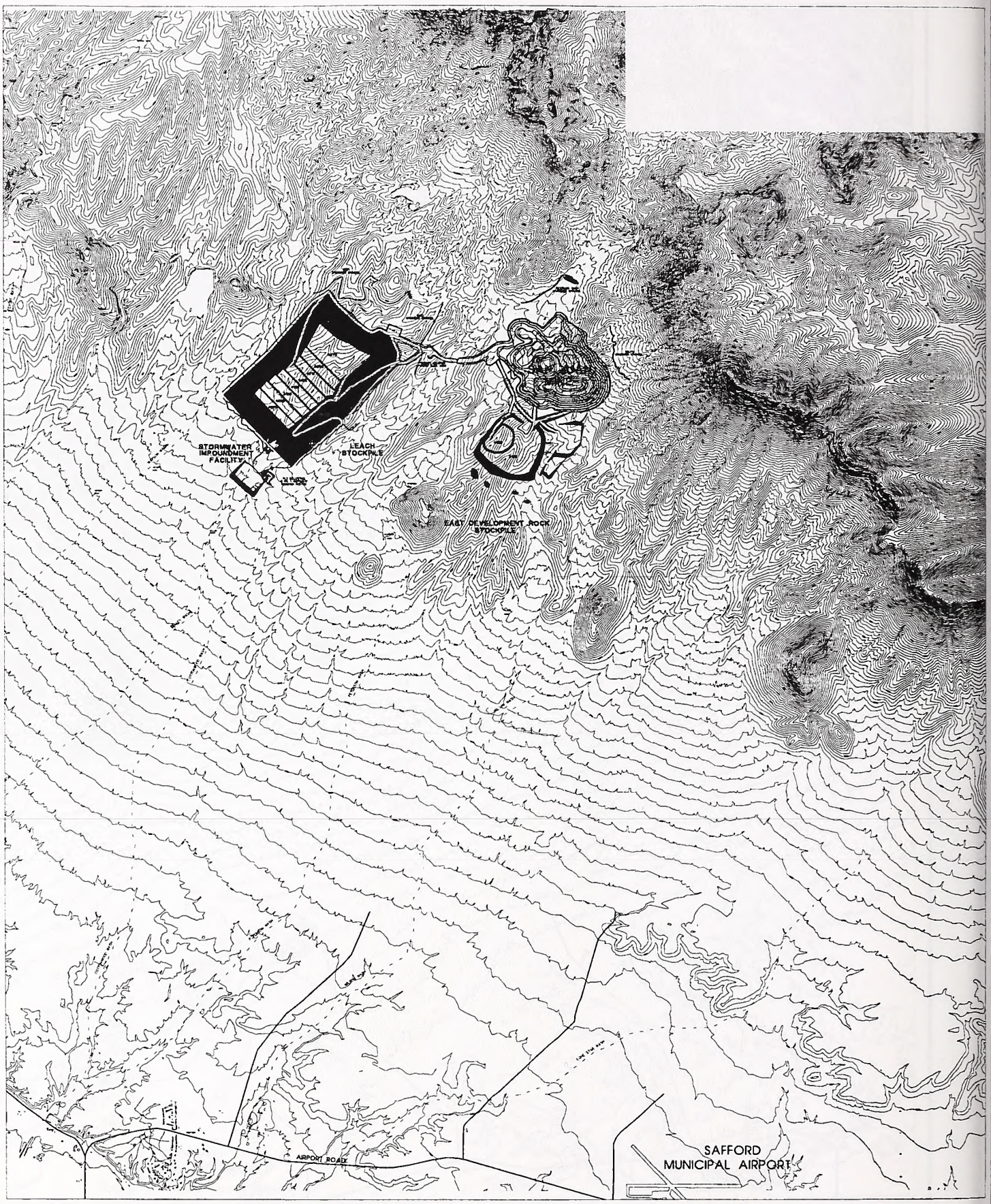
FEET

DOS POBRES/SAN JUAN MPO
CLEAN WATER ACT
404(b)(1) ALTERNATIVES ANALYSIS

FIGURE 7. ALTERNATIVE E: DOS POBRES ONLY

SWCA Inc. Environmental Consultants

JOB NUMBER	DRAWN BY	DATE
51-61700	KAD	1-17-97
FILE NAME: CADS C:\ACADIII\SAFFORD\NEWMPO\PLOT.DWG	CHECKED BY JT	REV.



Scale

0 3,000 6,000

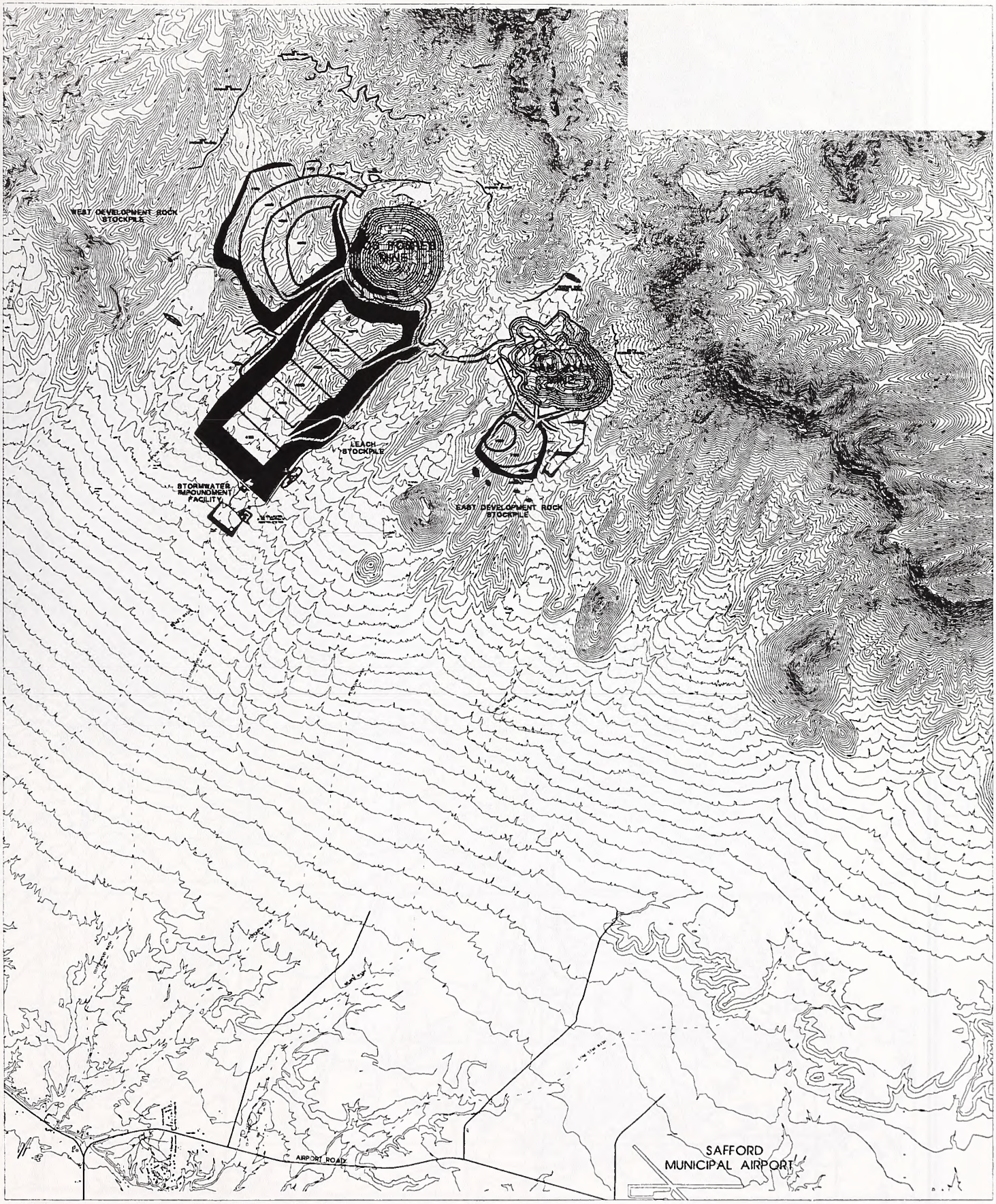
FEET

DOS POBRES/SAN JUAN MPO
CLEAN WATER ACT
404(b)(1) ALTERNATIVES ANALYSIS

FIGURE 8. ALTERNATIVE F: SAN JUAN ONLY

SWCA Inc. Environmental Consultants

JOB NUMBER 51-61700	DRAWN BY KAD	DATE 1-17-97
FILE NAME CADB C:\ACAD11\SAFFORD\NEWMPO\PLOT.DWG	CHECKED BY JT	REV



Scale

0 3,000 6,000

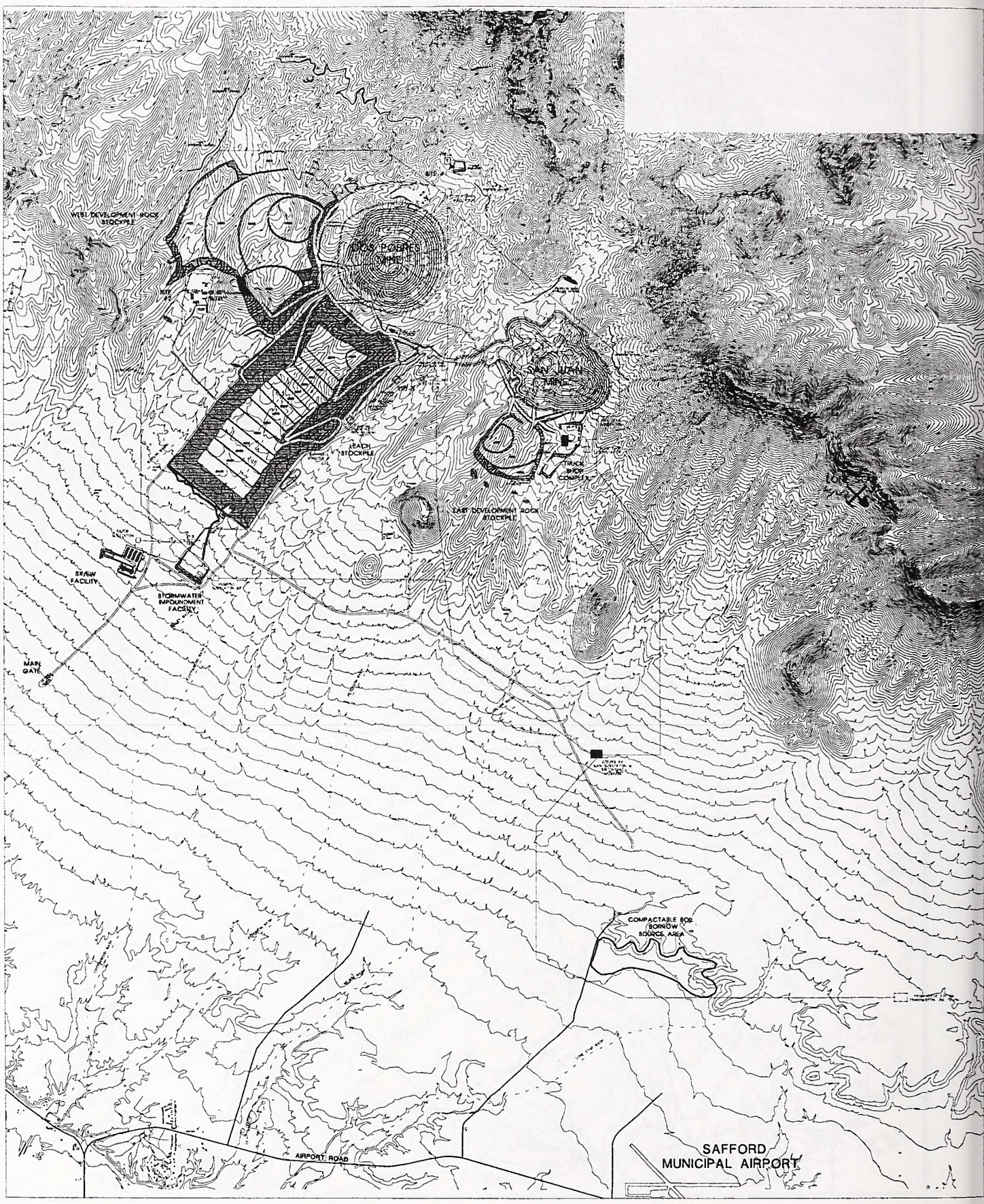
FEET

DOS POBRES/SAN JUAN MPO
CLEAN WATER ACT
404(b)(1) ALTERNATIVES ANALYSIS

FIGURE 9. ALTERNATIVE G: NO SET BACK AT DOS POBRES

SWCA Inc. Environmental Consultants

JOB NUMBER 51-61700	DRAWN BY KAD	DATE 1-17-97
FILE NAME: CADB C:\ACAD11\SAFFORD\NEWMPO\PLOT.DWG	CHECKED BY JT	REV



Alternative I

Scale

0 3,000 6,000

FEET

DOS POBRES/SAN JUAN MPO
CLEAN WATER ACT
404(b)(1) ALTERNATIVES ANALYSIS

FIGURE 10. ALTERNATIVE I: SINGLE REDUCED LEACH PAD/CRUSH CONVEY/ HAUL TRUCK PLACEMENT
(PDSI'S PREFERRED ALTERNATIVE)

SWCA Inc. Environmental Consultants

JOB NUMBER 51-61700	DRAWN BY KAD	DATE 1-13-97
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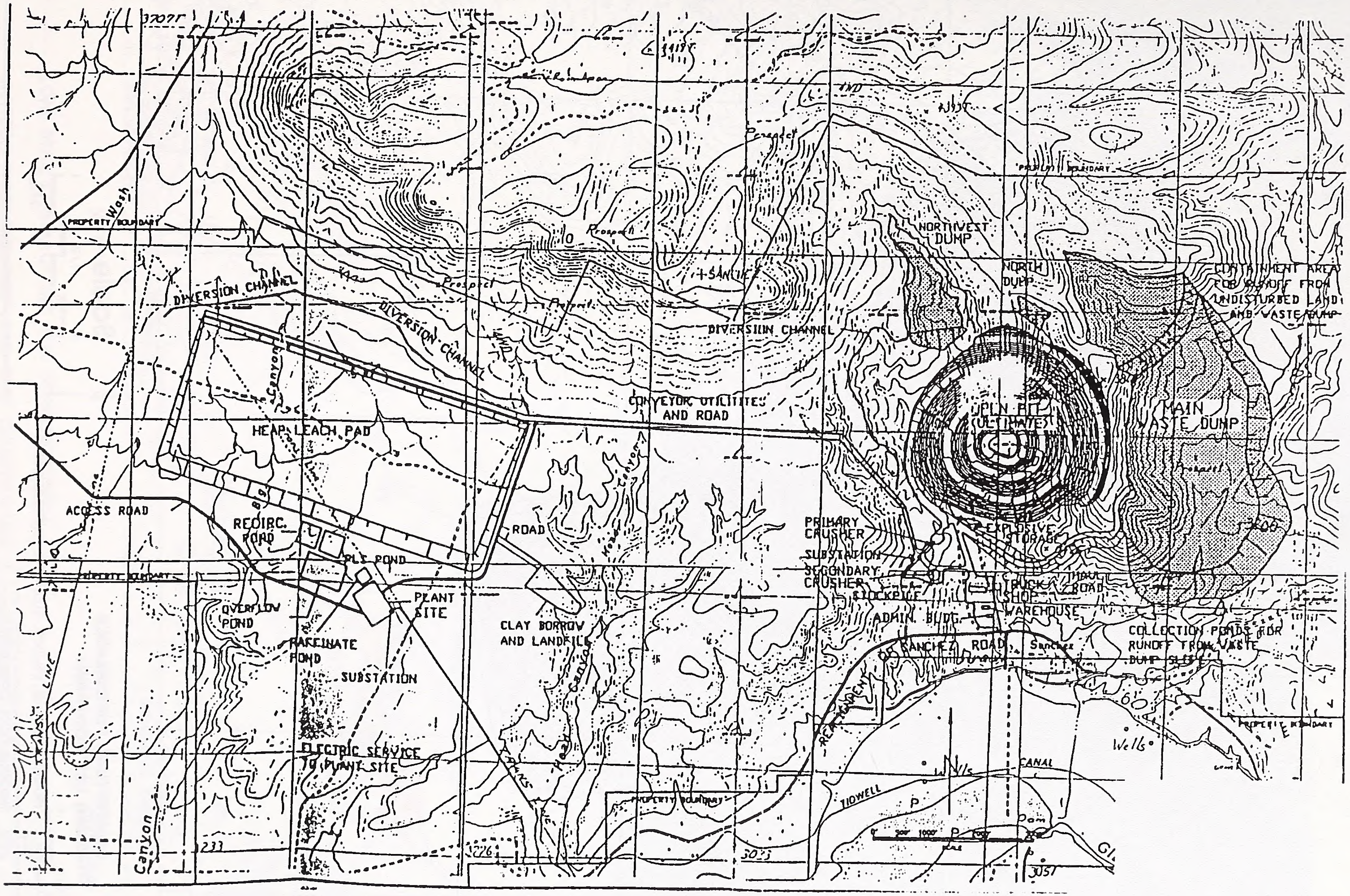


Scale

0 1500 3000

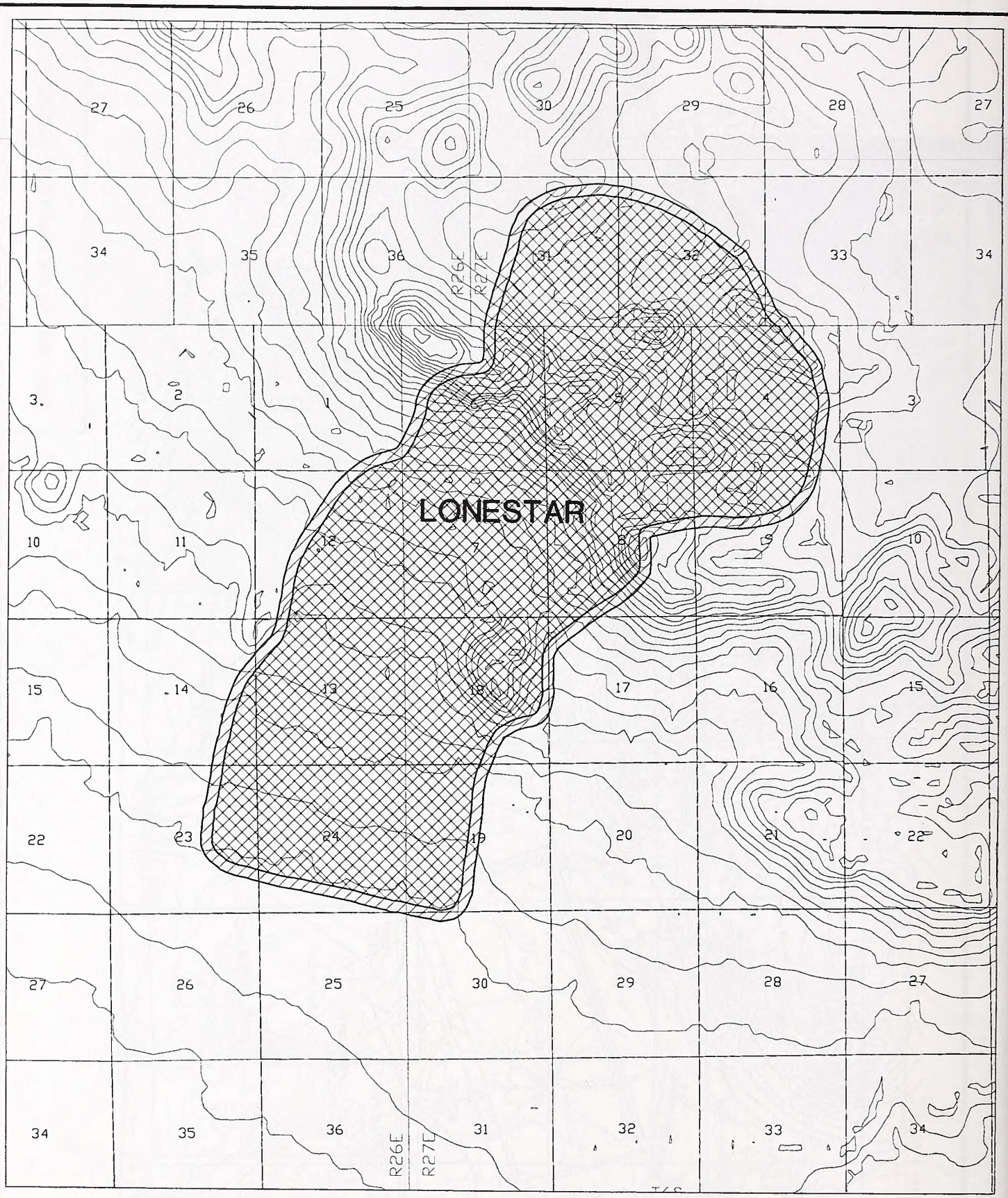
FEET

SWCA Inc. Environmental Consultants

JOB NUMBER 51-61700	DRAWN BY KAD	DATE 12-10-96
FILE NAME: CADA D:\ACAD11\SAFFORD\ALTJ.DWG	CHECKED BY JT	REV. DATE

404 B1 ALTERNATIVE ANALYSIS

FIGURE 11 ALTERNATIVE J



CONCEPTUAL FORESEEABLE MINING USE FOOTPRINT

TRANSITION USE (5-24% SURFACE DISTURBANCE)

PRODUCTION OPERATION AND SUPPORT (25-100% SURFACE DISTURBANCE)

N

Scale

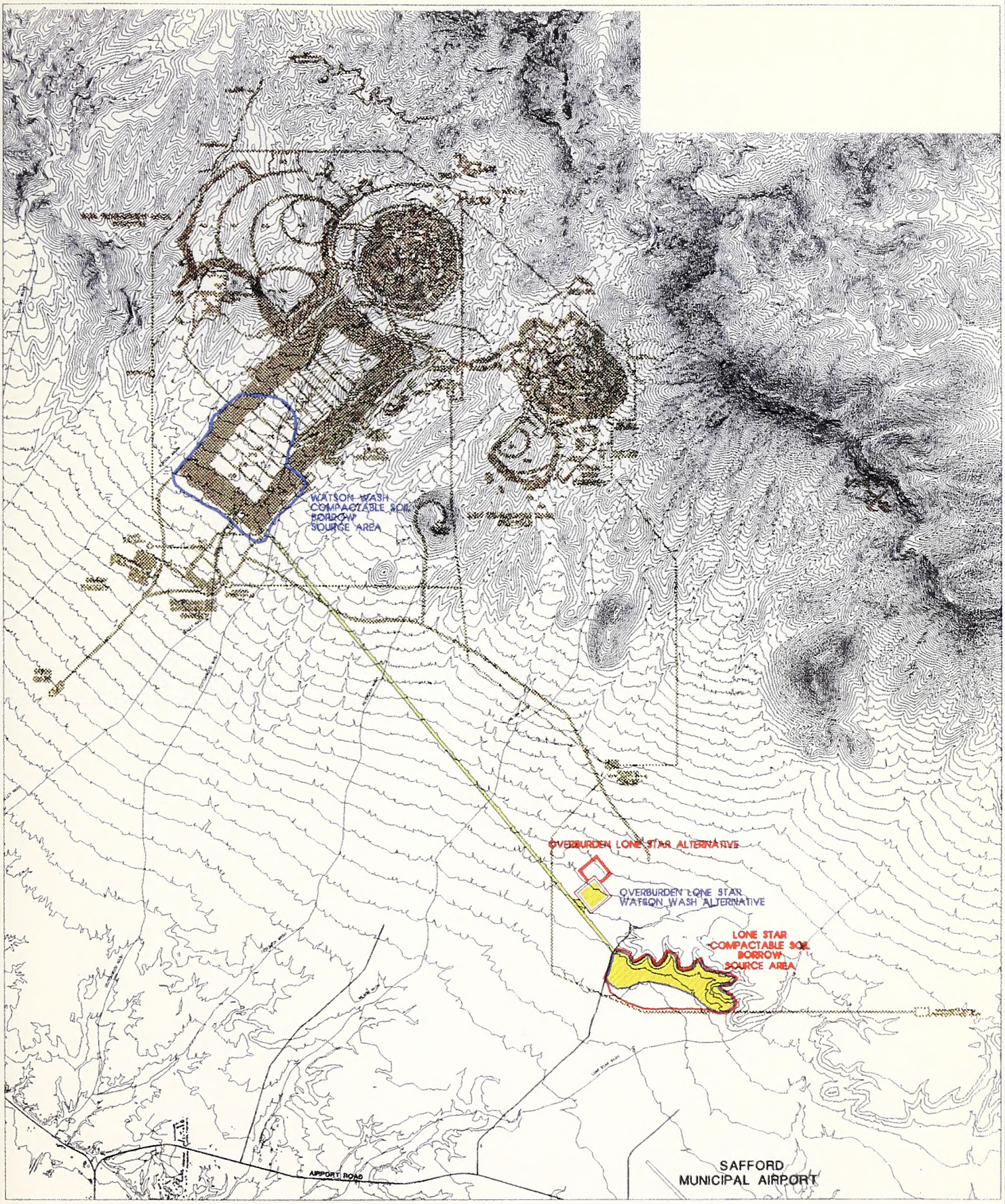
0 1/2 1

MILE

DOS POBRES/SAN JUAN MPO
404(b)(1) ALTERNATIVE ANALYSIS

FIGURE 12 ALTERNATIVE K

SWCA Inc. Environmental Consultants	JOB NUMBER 51-61700	DRAWN BY KAD	DATE 1-31-97
	FILE NAME: CADA C:\ACAD11\SAFFORD\LONESTAR.DWG	CHECKED BY JT	REV. DATE



KEY

LONE STAR COMPACTABLE SOIL BORROW SOURCE

WATSON WASH/REDUCED LONE STAR COMPACTABLE SOIL BORROW SOURCE

AREAS COMMON TO BOTH

Scale

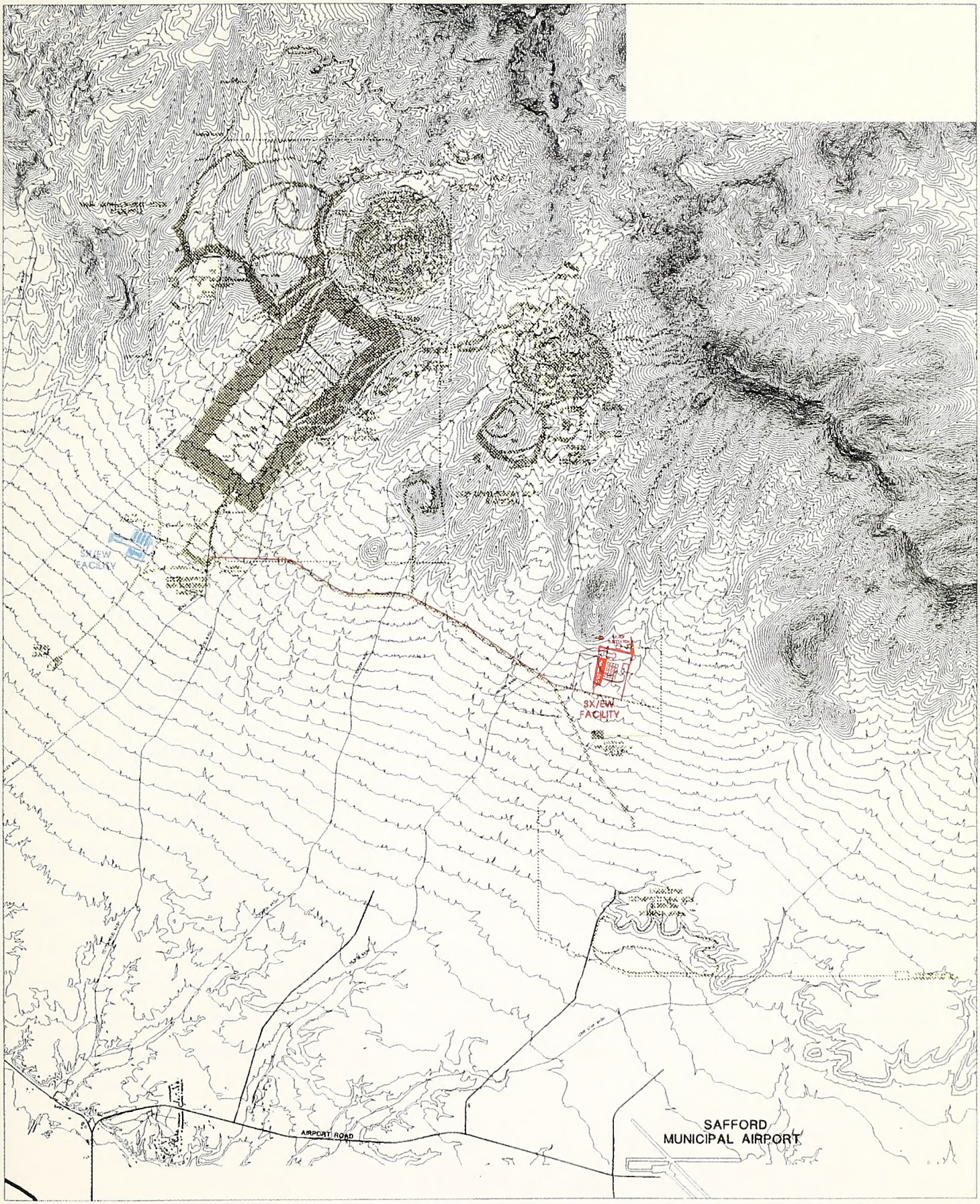
0 3,000 6,000 FEET

DOS POBRES/SAN JUAN PROJECT PLAN OF OPERATION ENVIRONMENTAL IMPACT STATEMENT

FIGURE 13. COMPACTABLE SOIL BORROW SOURCE ALTERNATIVE IN RELATIONSHIP TO CONFIGURATION ALTERNATIVE I.

SWCA Inc. Environmental Consultants

JOB NUMBER 51-61700	DRAWN BY KAD	DATE 1-17-96
FILE NAME: CADD C:\ACAD11\SAFFORD\ALTICLAY.DWG	CHECKED BY	REV. DATE 2-20-96



N

Scale

0 3,000 6,000

FEET

SWCA Inc. Environmental Consultants	JOB NUMBER 51-61700	DRAWN BY KAD	DATE 1-17-96
	FILE NAME: CADB C:\ACAD11\SAFFORD\ALT1SXEW.DWG	CHECKED BY	REV. DATE 1-21-97

DOS POBRES/SAN JUAN PROJECT PLAN OF OPERATION ENVIRONMENTAL IMPACT STATEMENT

FIGURE 14. EAST AND WEST SX/EW PLANT LOCATIONS IN RELATIONSHIP TO CONFIGURATION ALTERNATIVE I.

3. SUMMARY AND CONCLUSIONS

An alternatives analysis is required by the U.S. Army Corps of Engineers (COE) and the U.S. Environmental Protection Agency (EPA) to demonstrate compliance with guidelines established under the Clean Water Act (CWA), Section 404(b)(1) (40 CFR §230) for avoidance and minimization of impacts to waters of the United States. This analysis is designed to identify practicable alternative mine plan configurations for the Dos Pobres/San Juan Project proposed by PDSI.

The formulation of alternatives to the proposed Mining Plan of Operations (the Proposed Action) has been based upon information provided by the COE, BLM, and PDSI. Each alternative's practicability, in light of the specific technical, logistic, and economic criteria, is evaluated. Many of the alternatives considered were developed to minimize impacts to waters of the United States which in the project area are primarily ephemeral washes. None of the configuration or location alternatives considered would completely avoid impacts to waters of the U.S. and all practicable configuration or location alternatives would affect waters of the United States to varying degrees.

A total of nine configuration alternatives (Alternatives A-I), two location alternatives (J and K), two compactible soil borrow source alternatives, and two SX/EW alternatives were considered (Table 2).

3.1. Configuration Alternatives

Table 3 summarizes the practicability determination for configuration and location alternatives. Of the 11 alternatives considered, only alternative C, *Partial Backfill of San Juan Pit*, and alternative I, *Single Reduced Leach Pad/Crush Convey w/ Haul Truck Placement*, are practicable configuration alternatives, considering technical, logistic, and economic measures of practicability. The identification of alternatives considered represents a reasonable range of alternatives that exist to achieve the project's purpose and need and are technically capable of being accomplished. All alternatives eliminated were considered impracticable for logistic and/or economic reasons. Considering the constraints imposed by the ore bodies, the distribution of other ore reserves in the project area, and the nature and distribution of waters of the U.S. in the project area, the development of another practicable alternative similar or not to the range of alternatives considered in this analysis, that significantly minimizes or avoids impacts to waters of the U.S., is unlikely.

Table 3. List of Alternatives considered.

CONFIGURATION ALTERNATIVES
• Alternative A — Two Leach Stockpiles
• Alternative B — Single Leach Stockpile w/ Conveyor Stacker
• Alternative C — Partial Backfill of San Juan Pit
• Alternative D — Reduced San Juan Pit
• Alternative E — Dos Pobres Mine Only
• Alternative F — San Juan Mine Only
• Alternative G — No Set Back at Dos Pobres
• Alternative H — A Single 700 ft. High Leach Stockpile
• Alternative I — Single Reduced Leach Pad/Crush Convey w/ Haul Truck Placement
SAFFORD DISTRICT LOCATION ALTERNATIVES
• Alternative J — Develop Sanchez Mine First
• Alternative K — Develop Lone Star Mine First
COMPACTIBLE SOIL BORROW SOURCE ALTERNATIVES
• Lone Star Compactible Soil Borrow Source
• Watson Wash/Reduced Lone Star Compactible Soil Borrow Source
SOLVENT EXTRACTION/ELECTROWINNING PLANT LOCATION ALTERNATIVES
• East SX/EW Plant Location
• West SX/EW Plant Location

3.2. COMPACTIBLE SOIL BORROW SOURCE ALTERNATIVES

Only the Lone Star Compatible Soil Borrow source alternative is considered technically and logistically practicable.

3.3. SX/EW LOCATION ALTERNATIVES

Both of the SX/EW location alternatives are practicable. Each of these alternatives would be sited to avoid impacts to waters of the United States. The East facility would require construction of a pipeline corridor to transport PLS and raffinate solution between the SX/EW plant and the Leach Stockpile. This alternative would result in pipeline crossings of approximately 6 drainages identified as waters of the United States, including Talley, Cottonwood, Peterson, and Wilson Washes.

Table 4. Configuration and Safford District Location Alternative Practicability Comparison.

		Configuration and Safford District Location Alternatives										
		ALTERNATIVE A Mine Plan of Operations	ALTERNATIVE B Crush Convey/Single Leach Pad	ALTERNATIVE C Crush Convey/Single Leach Pad/Partial Backfill of San Juan Mine	ALTERNATIVE D Crush Convey/Single Leach Pad/Reduced San Juan Mine	ALTERNATIVE E Dos Pobres Only	ALTERNATIVE F San Juan Only	ALTERNATIVE G Crush Convey/Single Leach Pad/No Set Back for Sulfide Pit Limits	ALTERNATIVE H Crush Convey/Single 700' High Leach Pad	ALTERNATIVE I Single Reduced Area Leach Pad	ALTERNATIVE J Develop Sanchez Ore Deposit Prior to DP/SJ	ALTERNATIVE K Develop Lonestar Ore Deposit Prior to DP/SJ
CRITERIA	Land Position	Conflicts with Melody claims	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
	Haul Distances < 2.5 miles	YES	MOST	MOST	MOST	YES	YES	MOST	YES	YES	MOST (based upon existing MPO)	NOT KNOWN
	Spatially compatible with development of other ore reserves in the Safford Mining District	YES	YES	YES	YES	YES	YES	NO - Interferes with Dos Pobres Sulfide Ore reserve development	POSSIBLY – Reduction in the ability to provide additional storage capacity could limit development opportunities at DP and SJ	YES	YES	YES
	Sufficient data to determine economic and Technical feasibility	YES	NO	YES	YES	YES	YES	YES	YES	YES	NO	NO
	Leach Stock Pile Capacity Includes Buffer	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES
Jurisdictional Waters of U.S. Impacts (acres)		118.4 Direct =25.2 Indirect = 93.2	115.7 Direct = 22.5 Indirect = 93.2	113.0 Direct = 19.8 Indirect = 93.2	82.7 Direct = 16.5 Indirect = 66.2	78.9 Direct = 14.6 Indirect = 64.3	58.8 Direct = 9.1 Indirect = 49.7	107.0 Direct = 15.9 Indirect = 91.1	110.2 Direct = 17.0 Indirect = 93.2	114.6 Direct = 21.4 Indirect = 93.2	13 per ACOE	73.7 Direct = 40.3 Indirect = 33.4
PRACTICABLE		NO -- The conflict with the Melody Claims makes this alternative impracticable	NO – the feasibility of employing the elevating conveyor is technically uncertain.	YES -- Economics marginal because of a longer haulage profile for Dos Pobres, but variance associated with economic projections make it acceptable	NO – approximately 31 percent of the San Juan ore body would be undeveloped, lost revenues would have a significant adverse affect on NPV of capital and operating expenses	NO -- Economically Not practical; leachable ore reserves are reduced by approximately 53 percent; lost revenues would have a significant adverse affect on NPV of capital and operating expenses	NO -- Economically Not Practical; this alternative reduces leachble ore reserves by 47%, lost revenues would have a significant adverse affect on NPV of capital and operating expenses	NO -- Would interfere with potential future development of Dos Pobres Sulfide Deposit	NO -- Pad design would not provide buffer capacity for additional material that could be found during development; After year 8 area:volume ratio reduces recovery rates significantly	YES	Not at this time -- Data collection and prefeasibility studies necessary to determine project viability will take a number of years to complete	Not at this time -- Data collection and prefeasibility studies necessary to determine project viability will take a number of years to complete

APPENDIX B

LEGAL DESCRIPTIONS OF SELECTED AND OFFERED LANDS

SELECTED (FEDERAL) LANDS

Township 5 South, Range 26 East, GSRB&M

Parcel A: Sec. 19 SE1/4

Parcel B: Sec. 20 SW1/4, N1/2SE1/4, SW1/4 SE1/4; Lot 1

Parcel C: part of Secs. 22 and 23, plus all remaining of Secs. 26 and 27

The areas occupied by the unpatented lode claims of MS4579 and MS3298 as follows: MS4579 - Elevator Nos. 30 and 31, 36, 37, 38, and 40, except those parts of Elevator Nos. 36, 37, and 38 in Sec. 23; Ojala, except that part in Sec. 23; Gold Hill Nos. 4, 5, 20, 21, 22, 23, 24, 32, 33, 34, and 35; Foothills Nos. 55 and 56; Lucky Strike Nos. 12, 13, 14, 15, 16, and 17; MS3298 - Soda Pop, except that part in Sec. 25. Plus, Lots 1, 2, 3, 4, 5, 6, and 7 of Sec. 26.

Parcel D: Sec. 28 Lots 1, 2, 3, 4, and 5

Parcel E: Sec. 29 S1/2, NW1/4, W1/2NE1/4; Lots 1 and 2

Parcel F: Sec. 30 E1/2, E1/2SW1/4; Lots 3 and 4

Parcel G: Sec. 33 S1/2SW1/4; Lots 1, 2, 3, 4, and 5

Parcel H: Sec. 34 NE1/4 SE1/4; Lots 1, 2, 3, 4, 5, 6 and 7

Parcel I1: Sec. 35 E1/2 SE1/4, SE1/4NE1/4 Lots 4,5,6,7,8, and 9

Parcel I2: Sec. 36 all

Township 5 South, Range 27 East, GSRB&M

Parcel J: Sec. 31 NE1/4, E1/2NW1/4; Lots 1 and 2

Parcel K: Sec 32 N1/2, N1/2SW1/4, SE1/4; Lots 1 and 2

Parcel L: Sec 33 all

Township 6 South, Range 25 East, GSRB&M

Parcel M Sec. 13 N1/2

Parcel N Sec. 14 NE1/4

Township 6 South, Range 26 East, GSRB&M

Parcel O: Sec 1 NW1/4SW1/4, NW1/4SW1/4, S1/2SW1/4; Part of tract 37; part of MS4590 not patented; Lots 3, 4, 5, 6, 7, 8, 9, 10, 13, 14, 16, 17 and 18.

Parcel P: Sec. 2 S1/2, SW1/4NW1/4; Lots 5, 6, 7, 8, 9 and 10

Parcel Q: Sec. 3 S1/2, S1/2N1/2; Lots 1, 2, 3, and 6

Parcel R: Sec. 4 S1/2, SE1/4NW1/4,S1/2NE1/4; Lots 1, 2, 3, and 4

Parcel S: Sec. 5 SE1/4, E1/2SW1/4, Lot 1

Parcel T: Sec. 8 E1/2 E1/2NW1/4, E1/2W1/2NW1/4, NE1/4SW1/4, E1/2NW1/4SW1/4, E1/2SE1/4SW1/4.

Parcel U: Sec. 9 all

Parcel V: Sec 10 all

Parcel W: Sec. 11 all

Parcel X: Sec. 12 NW1/4; Part of Tract 37; Tract 38; Lots 5, 6, 7, 8, 9, 10, 11,12 and 13.

Parcel Y: Sec. 14 all

Parcel Z: Sec. 15 all

Parcel AA: Sec. 16 all

Parcel AB: Sec. 17 all

Parcel AC: Sec. 18 NE1/4, E1/2NW1/4; Lots 1 and 2
Parcel AD: Sec. 23 W1/2 NE1/4

Township 6 South, Range 27 East, GSRB&M

Parcel AE Sec. 3 SW1/4, S1/2NW1/4, Lots 3 and 4
Parcel AF Sec. 6 Part of MS4590 not patented Lots 5, 12, 13, and 14.

Township 6 South, Range 27 East, GSRB&M

Parcel AG Sec. 7 Lot 9 in the NW1/4
Parcel AH Sec. 7 Lot 12 situated in the E1/2SE1/4, excluding that part occupied by Tract 37
Parcel AI Sec. 9 SE1/4, S1/2NE1/4, SE1/4NW1/4, E1/2SW1/4 lot 1, 2, 3, 5, 6, and 7
Parcel AJ Sec. 10 NW1/4
Parcel AK: Sec. 17 S1/2, E1/2NE1/4; Lots 1, 3, 4 and 5
Parcel AL: Sec. 7 Tract 37 and Sec. 18
Parcel AM: Sec. 18 Lots 5, 6, 7, 8 and 9
Parcel AN: Sec. 20 N1/2

Township 6 South, Range 27 East, GSRB&M

Sec 35, NW1/4 NE1/4 NE1/4, N1/2 N1/2 SW1/4 NE1/4 NE1/4,
N1/2 S1/2 N1/2 SW1/4 NE1/4 NE1/4,
SE1/4 SE1/4 NE1/4 SW1/4 NE1/4 NE1/4,
S1/2 SW1/4 NW1/4 SW1/4 NE1/4 NE1/4,
SW1/4 SE1/4 NW1/4 SW1/4 NE1/4 NE1/4.

Altogether, federal lands consisting of 41 parcels totaling 16,925 more or less.

The federal lands described above will be subject to the following reservations, terms, and conditions:

EXCEPTING AND RESERVING TO THE UNITED STATES a right-of-way thereon for ditches or canals constructed by the authority of the United States. Act of August 30, 1890 (43 U.S.C. 945).

SUBJECT TO:

1. Those rights for an electric distribution line granted to Graham County Electric Cooperative, its successors and assigns, by Right-of-way No. AZA 1092 pursuant to the Act of March 4, 1911 (36 Stat. 1253; 43 U.S.C. 961), as amended, as to SE1/4SW1/4, Sec.2; E1/2E1/2SE1/4, Sec.10; W1/2, Sec. 11; NW1/4NW1/4, Sec. 14; E1/2E1/2, Sec. 15, T.6S.,R.26E., Gila and Salt River Meridian, Arizona. Issued on June 14, 1968, and to expire on June 12, 2018.

2. Those rights for a telephone and telegraph line granted to U.S. West Communication Inc. (formerly Mountain States Telephone and Telegraph Company), its successors and assigns, by Right-of-way No. AZA 2773 pursuant to the Act of March 4, 1911 (36 Stat. 1253; 42 U.S.C. 961), as amended, as to Lots 2, 3 and 4, N1/2SE1/4, Sec. 34, T.5S., R.26E., and Lots 6, 8 and 9, E1/2SW1/4, Sec. 2, T.6S., R.26E., Gila and Salt River Meridian, Arizona.

3. Those rights for a power transmission line granted to Graham County Electric Cooperative, its successors and assigns, by Right-of-way No. AZA 5340 pursuant to the Act of March 4, 1911 (36 Stat. 1253; 43 U.S.C. 961), as amended, as to S1/2SE1/4SW1/4, Sec. 2; N1/2NW1/4NE1/4, N1/2NE1/4NW1/4, Sec. 11, T.6S., R.26E., Gila and Salt River Meridian, Arizona.

4. Those rights for a 230 kV electric power transmission line granted to Arizona Electric Power Cooperative, its successors and assigns, by Right-of-way No. AZA 9015 pursuant to the Act of October 21, 1976 (90 Stat. 2776; 43 U.S.C. 1761) as to Lot 4, W1/2SW1/4, Sec. 11; NE1/4, N1/2NW1/4, Sec. 14, T.6S., R.26E., and S1/2NW1/4, Sec. 20, T.6S., R.27E., Gila and Salt River Meridian, Arizona.

5. Those rights for a Radio Station Site and Access Road granted to U.S. Communications Inc., its successors and assigns, by Right-of-way No. AZAR 029939 pursuant of the Act of March 4, 1911 (36 Stat. 1253; 43 U.S.C. 961) as to SE1/4SW1/4, SW1/4SE1/4, Sec. 2, T.6S., R.26E., Gila and Salt River Meridian, Arizona.

The land herein described as Lots 1 and 2, N1/2, N1/2SW1/4, SW1/4, Sec. 32, T.5S., R.27E., Gila and Salt River Meridian, Arizona, is subject to a reservation of all minerals deposits and rights, together with the right to prospect for, mine and remove the same, as appear on record, in Deed of Reconveyance dated May 23, 1942, recorded in Book 45 of Deeds, Page 310 of the official records of Graham County, Arizona.

The land herein described as N1/4, Sec. 16, T.6S., R.26E., Gila and Salt River Meridian, Arizona, is subject to a reservation of all minerals deposits and rights, together with the right to prospect for, mine and remove the same, as appear on record, in Deed of Reconveyance dated February 24, 1941, recorded in Book 91 of Deeds, Page 117 of the official records of Yuma County, Arizona.

Non-exclusive, non-possessory Right-of-way No. AZA 20637, for a 7.5 kV single phase powerline granted under the Act of October 21, 1976 (43 U.S.C. 1761) to Phelps Dodge Corporation and affecting the S1/2SW1/4, Sec. 2; NW1/4SW1/4, N1/2SE1/4SE1/4, SW1/4NE1/4SE1/4, S1/2NW1/4SE1/4, Sec. 3; S1/2NE1/4, SE1/4NW1/4, NW1/4NW1/4, NE1/4NE1/4SE1/4, Sec. 4; and Lot 1, Sec. 5, T.6S. R.26E., Gila and Salt River Meridian, Arizona will not be subject to. This right-of-way must be relinquished before or simultaneously at the time of title transfer.

OFFERED (PRIVATE) LANDS
BASE PACKAGE

Amado Property

PARCEL No. 1: The South Half of the Southwest Quarter of the Northwest Quarter; and North Half of the Southwest Quarter; and the Northwest Quarter of the Southeast Quarter of Section 3, Township 5 South, Range 27 East of the Gila and Salt River Base and Meridian, Graham County, Arizona.

PARCEL No. 2: A triangular shaped tract of land described as all that part of the South half of the Northeast quarter lying Northwest of a line beginning at the Northeast corner of the South half of the Northeast quarter running thence Southwesterly to the Southwest corner of the Northeast quarter of Section 10, Township 5 South, Range 27 East of the Gila and Salt River Base and Meridian, Graham County, Arizona.

Curtis Property

PARCEL No. 1: The Northwest Quarter of the Southwest Quarter of Section 11, Township 5 South, Range 27 East. The Northeast Quarter of the Southeast Quarter of Section 10 (more particularly described in the lease) , Township 5 South, Range 27 East, Gila and Salt River Meridian, Graham County.

PARCEL No. 2. The West Half of the Section 14, and the West Half of Section 23, all in Township 5 South, Range 27 East, Gila and Salt River Meridian, Graham County, Arizona.

Norton Property

Sec. 25 SW1/4 SW1/4 T5S R22E
Sec. 25 SW1/4 SE1/4 T5S R22E
Gila and Salt River Meridian, Arizona

Musnicki Property

The East Half of the southeast quarter of Section 9 and the southeast quarter and the east half of the northeast quarter of Section 10 in Township fourteen south of Range 28 east of the Gila and Salt River Meridian, Arizona, containing 320 acres.

Davison Property

PARCEL No. 1: Lots 1 thru 4 , inclusive, Section 24, Township 18 South, Range 16 East of the Gila and Salt River Base and Meridian, Pima County, Arizona.

PARCEL No. 2: The West Half of the Northeast Quarter of Section 24, Township 18 south, Range 16 East of the Gila and Salt River Base and Meridian, Pima County, Arizona and containing .

PARCEL No. 3: The Northwest Quarter of Section 24, Township 18 South, Range 16 East of the Gila and Salt River Base and Meridian, Pima County, Arizona.

PARCEL No. 4: The West Half of the Southeast Quarter of Section 24, Township 18 south, Range 16 East of the Gila and Salt River Base and Meridian, Pima County, Arizona.

Feulner Property

PARCEL No. 1: Lot 1, of Section 5, Township 18 South, Range 18 East, Gila and Salt River Base and Meridian, Pima County, Arizona and containing 160 acres more or less.

PARCEL No. 2: Lot 2 and South half of the Northeast quarter and the Southeast quarter of Section 5, Township 18 South, Range 18 East, Gila and Salt River Base and Meridian, Pima County, Arizona and containing 160 acres more or less.

Schock Property

PARCEL No. 1: The Southeast quarter of Section 9; all in Township 20 South, Range 18 East, of the Gila and Salt River base and meridian, in Santa Cruz County, Arizona.

PARCEL No.2: The south half of the Southwest quarter of Section 10, Township 20 South, Range 18 East, the Gila and Salt River base and meridian, Santa Cruz County, Arizona.

OPTIONAL PACKAGE

Tavasci Marsh Property

The northwest quarter of Section 10, Township 9 North, Range 22 East, G.&S.R.B.&M., Navajo County, Arizona, more particularly described as follows:

COMMENCING at the west Quarter Corner of said Section 10; THENCE S89 degree 33' 27" E, 495.00 feet to a point marking the centerline and beginning of a 60.00 foot wide highway easement described in Docket 312, Page 959; THENCE N36 degrees 41' 05"W, along said centerline, 87.87 feet to a point marking the beginning of a tangent curve, having a radius of 302.92 feet to the right; THENCE northwesterly, continuing along said centerline and along the arc of said curve, through a central angle of 22 degrees 24' 26", having an arc distance of 118.47 feet; THENCE N14 degrees 16' 39"W, continuing along said centerline, 28.00 feet; THENCE N75 degrees 43' 21"E, 20.00 feet to the easterly edge of pavement in the aforementioned easement, said point also marking the POINT OF BEGINNING; THENCE along said easterly edge of pavement the following courses and distances:

N14 degree 16' 39"W, 211.00 feet to point marking the beginning of a tangent curve, having a radius of 801.02 feet to the right; THENCE northerly, along the arc of said curve, through a central angle of 08 degrees 21' 35", having an arc distance of 116.87 feet; THENCE N05 degrees 55' 04", 562.22 feet; THENCE, leaving said edge of pavement, N89 degrees 14' 52" E, 304 feet, more or less to a point at the elevation of 6535 feet (based on the elevation of the northwest corner of said Section 10 begin 6561 feet as shown on the Show Low South Quadrangle, mapped, edited, and published by the USGS and dated 1977); THENCE S14 degrees 07' 59"E, 121.63 feet, more or less, to a point at said elevation of 6535 feet; THENCE S25 degrees 25' 45"E, 109.59 feet, more or less, to a point at said elevation of 6535 feet; THENCE S33 degrees 09' 48" E, 120.65 feet, mor or less, to a point

at said elevation of 6535 feet, THENCE S34 degrees 52' 31" E, 120.67 feet, more or less, to a point at said elevation of 6535 feet; THENCE S35 degrees 08' 55" E, 119.85 feet, more or less, to a point at said elevation of 6535 feet; THENCE S38 degrees 11' 27" E, 95.43 feet; more or less, to a point at said elevation of 6535 feet; THENCE S38 degrees 34' 30" W, 64.01 feet, more or less, to a point at said elevation of 6535 feet; THENCE S66 degrees 18' 40" W 604 feet, more or less, the POINT OF BEGINNING.

Lincoln Ranch Property

PARCEL No. 1: The Southeast Quarter and the Southwest quarter of the Southeast Quarter of Section 15; and the South half of the North half of Section 23 all in Township Ten North, Meridian, La Paz County, Arizona.

PARCEL No. 2: The Northeast quarter of the Northeast quarter of Section 22, Township 10 North, Range 14 West, Gila and Salt River Base and Meridian, La Paz County, Arizona.

PARCEL N0. 3: The South half of Section 14 and North half of Southeast quarter and the Southeast quarter of the Southeast quarter of Section 15; all in Township 10 North, Range 14 West, Gila and Salt River Base and Meridian, La Paz County, Arizona.

PARCEL No. 4: The North Half of the North half of Section 23, Township 10 North, Range 14 West, Gila and Salt River Base and Meridian, La Paz County, Arizona.

SUBJECT TO any existing reservations, restrictions, easements and right of way of record.

Lehner Ranch Property

PARCEL No. 1: The Southwest Quarter of the Northeast Quarter, and that portion of the Northwest Quarter of the Northeast Quarter of Section 21, Township 23 South, Range 22 East of the Gila and Salt River Base and Meridian, (more particularly described in the lease)

PARCEL No. 2: Easement, twenty-five (25) feed wide, for ingress and egress as created in Document No. 951024798 over that part of Northwest Quarter of the Northeast Quarter of Section 21, Township 23 South, Range 22 East of the Gila and Salt River Base and Meridian, Cochise County, Arizona (more particularly described in the lease).

Freeland Property

PARCEL No. 1: The East half of the Southwest quarter of the Northeast quarter of Section 7, Township 14 South, Range 28 East of the Gila and Salt River Base and Meridian, Cochise County, Arizona.

PARCEL N0. 2: The South half of the Northwest quarter of Section 4, Township 14 South, Range 28 East of the Gila and Salt River Base and Meridian, Cochise County, Arizona.

PARCEL No. 3: The Northwest quarter of the Northeast quarter of Section 9, Township 14 South, Range 28 East of the Gila and Salt River Base and Meridian, Cochise County, Arizona.

Except all coal and other minerals as reserved in Patent for the United States of America.

Butler-Borg Property

Lot 1, 2, 3, 4 and the East half of Section 7, Township 14 South, Range 28 East, of the Gila and Salt River Base and Meridian, Cochise County, Arizona.

Clyne I Remainder Property

Cherry Spring Tract: The Southwest quarter of Section 10, Township 19 South, Range 18 East of the Gila and Salt River Base and Meridian, Pima County, Arizona; and

The Southwest quarter of the Northwest Quarter of Section 10, Township 19 South, Range 18 East of the Gila and Salt River Base and Meridian, Pima County, Arizona; and

The Southeast quarter of the Northeast quarter of Section 9, Township 19 South, Range 18 East of the Gila and Salt River Base and Meridian, Pima County, Arizona;

Except all coal and other minerals as reserved in the Patent from the United States of America.

Clyne II Property

The Southwest quarter of the Southwest quarter of Section 15, T19S, R18E, Gila and Salt River Base and Meridian, Pima County, Arizona.

The East half of the Northeast quarter and the Northeast quarter of the Southeast quarter of Section 21, Township 9 South, Range 18 east, Gila and Salt River Base and Meridian, Pima County, Arizona.

The Northwest quarter and the North half of the Southwest quarter of Section 22, Township 19 south, Range 18 East, Gila and Salt River Base and Meridian, Pima County, Arizona.

APPENDIX C

VRM CLASS OBJECTIVES

VISUAL RESOURCE MANAGEMENT CLASS OBJECTIVES

Bureau Manual 8410, Visual Resource Inventory (BLM 1986), places the management of visual resources (scenery) into four management classes.

Class I. The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; it does not, however, preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.

Class II. The objective of this class is to retain the existing character of the landscape. The level of change on the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements of form, line, color, and texture found in the predominant natural features of the characteristic landscape.

Class III. The objective of this class is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV. The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. Every attempt should be made, however, to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

APPENDIX D

ARCHAEOLOGICAL SITES IN THE PROJECT AREA

Table D-1. Summary of Archaeological Sites Recorded on BLM-administered (i.e., Selected) Lands in Dos Pobres/San Juan Project Study Area.

(Eligibility criteria key: A - associated with events that have made a significant contribution to the broad patters of our history; B - associated with the lives of persons significant in our past; C - embodies the distinctive characteristics of a type, period, or method of construction, or that represents a significant and distinguishable entity whose components may lack individual distinction; D - have yielded, or have potential to yield, information important in prehistory or history.)

ASM Site Number	Site Type/ Temporal Affiliation	Land Management Status	National Register Eligibility/Criteria
AZ CC:2:132	Rock features/Prehistoric; Water control features/Prehistoric or Historic	BLM	ineligible
AZ CC:2:146	Petroglyph/Prehistoric	BLM	potentially eligible/D
AZ CC:2:147	Petroglyph, rock shelter, lithic scatter/Prehistoric	BLM	potentially eligible/D
AZ CC:2:148	Rock feature/Prehistoric or Historic	BLM	potentially eligible/D
AZ CC:2:149	Petroglyph/Prehistoric	BLM	potentially eligible/D
AZ CC:2:151	Lithic scatter/Prehistoric	BLM	potentially eligible/D
AZ CC:2:152	Petroglyph/Prehistoric	BLM	potentially eligible/D
AZ CC:2:153	Artifact scatter/Prehistoric	BLM	potentially eligible/D
AZ CC:2:162	Mining activity/Historic	BLM/PD	ineligible
AZ CC:2:183	Water control feature/ Historic or Recent	BLM	ineligible
AZ CC:2:184	Water control feature/ Historic or Recent	BLM	ineligible
AZ CC:2:186	Artifact Scatter/Prehistoric	BLM	potentially eligible/D
AZ CC:2:187	Camp/Historic to recent	BLM	potentially eligible/ D and possibly A
AZ CC:2:188	Artifact scatter/Prehistoric; Habitation/Historic to recent	BLM	potentially eligible/D
AZ CC:2:189	Camp/Historic	BLM	potentially eligible/ D and possibly A
AZ CC:2:190	Artifact scatter and mining activity/Historic	BLM	potentially eligible/D
AZ CC:2:191	Artifact scatter/Prehistoric; Rock feature/Historic	BLM	potentially eligible/D
AZ CC:2:192	Lithic scatter/Prehistoric; Water control features and rock feature/Historic	BLM/PD	potentially eligible/ D and possibly A
AZ CC:2:193	Rock features/Prehistoric or Historic	BLM	potentially eligible/D
AZ CC:2:194	Lithic Procurement/Prehistoric	BLM	potentially eligible/D
AZ CC:2:195	Artifact scatter/Prehistoric; Mining activity/Historic	BLM	potentially eligible/ D and possibly A
AZ CC:2:196	Artifact Scatter/Prehistoric; Mining Activity/Historic	BLM	potentially eligible/D
AZ CC:2:197	Mining activity and artifact scatter/Historic or Recent	BLM	potentially eligible/ D and possibly A

Table D-1, continued. Summary of Archaeological Sites Recorded on BLM-administered (i.e., Selected) Lands in Dos Pobres/San Juan Project Study Area

(Eligibility criteria key: A - associated with events that have made a significant contribution to the broad patters of our history; B - associated with the lives of persons significant in our past; C - embodies the distinctive characteristics of a type, period, or method of construction, or that represents a significant and distinguishable entity whose components may lack individual distinction; D - have yielded, or have potential to yield, information important in prehistory or history.)

ASM Site Number	Site Type/ Temporal Affiliation	Land Management Status	National Register Eligibility/Criteria
AZ CC:2:198	Camp/Historic	BLM	potentially eligible/ D and possibly A
AZ CC:2:199	Lithic Procurement/Prehistoric	BLM	potentially eligible/D
AZ CC:2:200	Rock features/Prehistoric	BLM/PD	potentially eligible/D
AZ CC:2:201	Lithic scatter/Prehistoric	BLM	potentially eligible/D
AZ CC:2:202	Mining activity and camp/Historic	BLM	potentially eligible/ D and possibly A
AZ CC:2:203	Mining activity and camp/Historic	BLM	potentially eligible/ D and possibly A
AZ CC:2:204	Mining activity and camp/Historic or Recent	BLM	potentially eligible/ D and possibly A
AZ CC:2:205	Lithic procurement/Prehistoric	BLM	potentially eligible/D
AZ CC:2:206	Artifact scatter/Historic	BLM	ineligible
AZ CC:2:207	Rock feature/Historic or recent	BLM	ineligible
AZ CC:2:208	Rock feature/Prehistoric or Historic	BLM	ineligible
AZ CC:2:209	Rock feature/Prehistoric or Historic	BLM	ineligible
AZ CC:2:210	Lithic procurement/Prehistoric	BLM	potentially eligible/D
AZ CC:2:211	Rock feature/Prehistoric	BLM	potentially eligible/D
AZ CC:2:212	Lithic procurement/Prehistoric	BLM	potentially eligible/D
AZ CC:2:213	Lithic procurement/Prehistoric	BLM	potentially eligible/D
AZ CC:2:214	Lithic procurement/Prehistoric	BLM	potentially eligible/D
AZ CC:2:215	Lithic scatter and rock features/Prehistoric	BLM	potentially eligible/D
AZ CC:2:216	Mining activity and camp/Historic	BLM	potentially eligible/ D and possibly A
AZ CC:2:217	Lithic scatter/Prehistoric	BLM	potentially eligible/D
AZ CC:2:218	Rock feature/Prehistoric; Water control features/Historic	BLM	potentially eligible/ D and possibly A
AZ CC:2:219	Lithic scatter/Prehistoric	BLM	potentially eligible/D
AZ CC:2:220	Rock features/Prehistoric	BLM	potentially eligible/D
AZ CC:2:221	Lithic scatter/Prehistoric	BLM	potentially eligible/D
AZ CC:2:222	Rock features/Prehistoric	BLM	potentially eligible/D
AZ CC:2:223	Rock features/Prehistoric or Historic	BLM	potentially eligible/D

Table D-1, continued. Summary of Archaeological Sites Recorded on BLM-administered (i.e., Selected) Lands in Dos Pobres/San Juan Project Study Area

(Eligibility criteria key: A - associated with events that have made a significant contribution to the broad patters of our history; B - associated with the lives of persons significant in our past; C - embodies the distinctive characteristics of a type, period, or method of construction, or that represents a significant and distinguishable entity whose components may lack individual distinction; D - have yielded, or have potential to yield, information important in prehistory or history.)

ASM Site Number	Site Type/ Temporal Affiliation	Land Management Status	National Register Eligibility/Criteria
AZ CC:2:224	Mining camp/Historic	BLM	potentially eligible/ D and possibly A
AZ CC:2:225	Rock features/Prehistoric	BLM	potentially eligible/D
AZ CC:2:226	Rock feature/Prehistoric or Historic	BLM	potentially eligible/D
AZ CC:2:227	Rock feature/Prehistoric	BLM	potentially eligible/D
AZ CC:2:228	Artifact scatter/Prehistoric	BLM	potentially eligible/D
AZ CC:2:229	Rock features/Prehistoric	BLM	potentially eligible/D
AZ CC:2:230	Rock feature/Historic or recent	BLM	potentially eligible/D
AZ CC:2:231	Rock features and petroglyphs/ Prehistoric	BLM	potentially eligible/ D and possibly A
AZ CC:2:232	Rock features/Historic	BLM	potentially eligible/D
AZ CC:2:233	Rock features/Prehistoric	BLM	potentially eligible/D
AZ CC:2:234	Rock shelter and rock feature/Prehistoric or Historic	BLM	potentially eligible/D
AZ CC:2:239	Camp/Historic	BLM	ineligible
AZ CC:2:240	Mining activity/Historic	BLM	potentially eligible/D
AZ CC:2:260	Water control feature/ Historic to recent	BLM	ineligible
AZ CC:2:261	Mining activity/Historic	BLM	potentially eligible/D

Table D-2. Summary of Archaeological Sites Recorded on PD-owned Land in Dos Pobres/San Juan Project Study Area.

(Eligibility criteria key: A - associated with events that have made a significant contribution to the broad patters of our history; B - associated with the lives of persons significant in our past; C - embodies the distinctive characteristics of a type, period, or method of construction, or that represents a significant and distinguishable entity whose components may lack individual distinction; D - have yielded, or have potential to yield, information important in prehistory or history).

ASM Site Number	Site Type/ Temporal Affiliation	Land Management Status	National Register Eligibility/Criteria
AZ CC:2:150	Petroglyph/Prehistoric	PD	potentially eligible/D
AZ CC:2:154	Rock features/Prehistoric or Historic	PD	potentially eligible/D
AZ CC:2:155	Lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:156	Petroglyph/Prehistoric	PD	potentially eligible/D
AZ CC:2:157	Petroglyph/Prehistoric	PD	potentially eligible/D
AZ CC:2:158	Petroglyph/Prehistoric	PD	potentially eligible/D
AZ CC:2:159	Rock features/Prehistoric or Historic	PD	potentially eligible/D
AZ CC:2:160	Rock features and artifact scatter/Prehistoric; Rock feature/Historic	PD	potentially eligible/D
AZ CC:2:161	Corral/Historic	PD	potentially eligible/ A and possibly D
AZ CC:2:162	Mining activity/Historic	PD/BLM	ineligible
AZ CC:2:163	Mining activity/Historic	PD	potentially eligible/ A and possibly D
AZ CC:2:164	Rock feature and artifact scatter/Prehistoric; Artifact scatter/Historic	PD	potentially eligible/D
AZ CC:2:165	Mining activity and artifact scatter/Historic	PD	potentially eligible/D
AZ CC:2:166	Petroglyph, rock feature/Prehistoric	PD	potentially eligible/D
AZ CC:2:167	Road segment/Historic	PD	potentially eligible/ A and possibly D
AZ CC:2:168	Artifact scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:169	Rock features and artifact scatter/Prehistoric; Mining activity and artifact scatter/Historic	PD	potentially eligible/D
AZ CC:2:170	Artifact scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:171	Lithic scatter, quarry/Prehistoric	PD	potentially eligible/D
AZ CC:2:192	Lithic scatter/Prehistoric; Water control features and rock feature/Historic	PD/BLM	potentially eligible/ D and possibly A
AZ CC:2:200	Rock features/Prehistoric	PD/BLM	potentially eligible/D

Table D-2, (continued). Summary of Archaeological Sites Recorded on PD-owned Land in Dos Pobres/San Juan Project Study Area.

(Eligibility criteria key: A - associated with events that have made a significant contribution to the broad patters of our history; B - associated with the lives of persons significant in our past; C - embodies the distinctive characteristics of a type, period, or method of construction, or that represents a significant and distinguishable entity whose components may lack individual distinction; D - have yielded, or have potential to yield, information important in prehistory or history).

ASM Site Number	Site Type/ Temporal Affiliation	Land Management Status	National Register Eligibility/Criteria
AZ CC:2:241	Petroglyph/Prehistoric	PD	potentially eligible/ C and D
AZ CC:2:242	Camp and artifact scatter/Historic	PD	potentially eligible/D
AZ CC:2:243	Rock feature and artifact scatter/Historic	PD	potentially eligible/D
AZ CC:2:244	Mining activity/Historic	PD	potentially eligible/D
AZ CC:2:245	Rock feature/Prehistoric or Historic	PD	potentially eligible/D
AZ CC:2:246	Lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:247	Mining activity/Historic	PD	potentially eligible/D
AZ CC:2:248	Mining activity/Historic	PD	potentially eligible/D
AZ CC:2:249	Rock features and lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:250	Mining activity/Historic	PD	potentially eligible/D
AZ CC:2:251	Mining activity, rock features, artifact scatter/ Historic	PD	potentially eligible/D
AZ CC:2:252	Mining activity/Historic	PD	potentially eligible/D
AZ CC:2:253	Rock features and lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:254	Rock features and lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:255	Rock feature/Prehistoric	PD	potentially eligible/D
AZ CC:2:256	Water control feature/Historic	PD	potentially eligible/D
AZ CC:2:257	Rock features and artifact scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:258	Camp and artifact scatter/Historic	PD	potentially eligible/D
AZ CC:2:259	Ceramic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:263	Water control features/Historic	PD	potentially eligible/D
AZ CC:2:264	Lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:265	Corral, water tank, artifact scatter/Historic	PD	potentially eligible/D
AZ CC:2:266	Rock features/Prehistoric Water control feature/ Historic	PD	potentially eligible/D

Table D-2, (continued). Summary of Archaeological Sites Recorded on PD-owned Land in Dos Pobres/San Juan Project Study Area.

(Eligibility criteria key: A - associated with events that have made a significant contribution to the broad patters of our history; B - associated with the lives of persons significant in our past; C - embodies the distinctive characteristics of a type, period, or method of construction, or that represents a significant and distinguishable entity whose components may lack individual distinction; D - have yielded, or have potential to yield, information important in prehistory or history).

ASM Site Number	Site Type/ Temporal Affiliation	Land Management Status	National Register Eligibility/Criteria
AZ CC:2:267	Rock features and lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:268	Ceramic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:269	Rock features and lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:270	Rock feature and lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:271	Rock features and lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:272	Rock features and lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:273	Rock features and lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:274	Rock feature and lithic scatter/Prehistoric	PD	potentially eligible/D
AZ CC:2:275	Water control features/Historic	PD	potentially eligible/ D and possibly A
AZ CC:2:276	Water control features/Historic	PD	potentially eligible/ D and possibly A
AZ CC:2:277	Water control features/Historic	PD	potentially eligible/ D and possibly A

Table D-3. Summary of Archaeological Sites on Arizona State Land Recorded in Dos Pobres/San Juan Project Study Area

ASM Site Number	Site Type/ Temporal Affiliation	Land Management Status	National Register Eligibility/Criteria
AZ CC:2:176	Water control feature/ Historic or Recent	State	ineligible

APPENDIX E

DESCRIPTIONS OF OFFERED LANDS NOT INCLUDED IN THE LAND EXCHANGE ALTERNATIVE

This appendix describes the existing natural and human environment of the three PD-owned properties that were made available as part of the optional package of offered lands but were not included in the Land Exchange alternative. These are the Davison, Lehner Ranch, and Lincoln Ranch properties.

DAVISON PROPERTY

This 428-acre property is located east of Davidson Canyon at the south end of the Empire Mountains, in Pima County, Arizona. The terrain is hilly, with elevations ranging from 4,300 to 4,840 ft above msl. A steep-sided canyon runs through the southeastern end of the property. Several small ephemeral washes dissect the parcel (SWCA 1995a).

Land Use

The Davison property lies within the perimeter of the Empire-Cienega RCA. It represents approximately one percent of the total area within that perimeter. The total boundary of the Davison property is four miles, of which 2.0 mi to the south and west is abutted by state lands. The remaining 2.0 mi abuts other private lands. Figure E-1 shows the property and surrounding land ownership.

This property is accessible via an unimproved dirt road maintained by the U.S. Forest Service (USFS) off Highway 83. Because the Davison property is privately-owned, no public recreation is authorized. However, because the property falls within the Empire-Cienega RCA, potential recreational uses include, but are not limited to, hiking, camping, picnicking, hunting, and bird and wildlife watching. This property is located within the watershed of a segment of Cienega Creek that BLM has recommended for Wild and Scenic River designation.

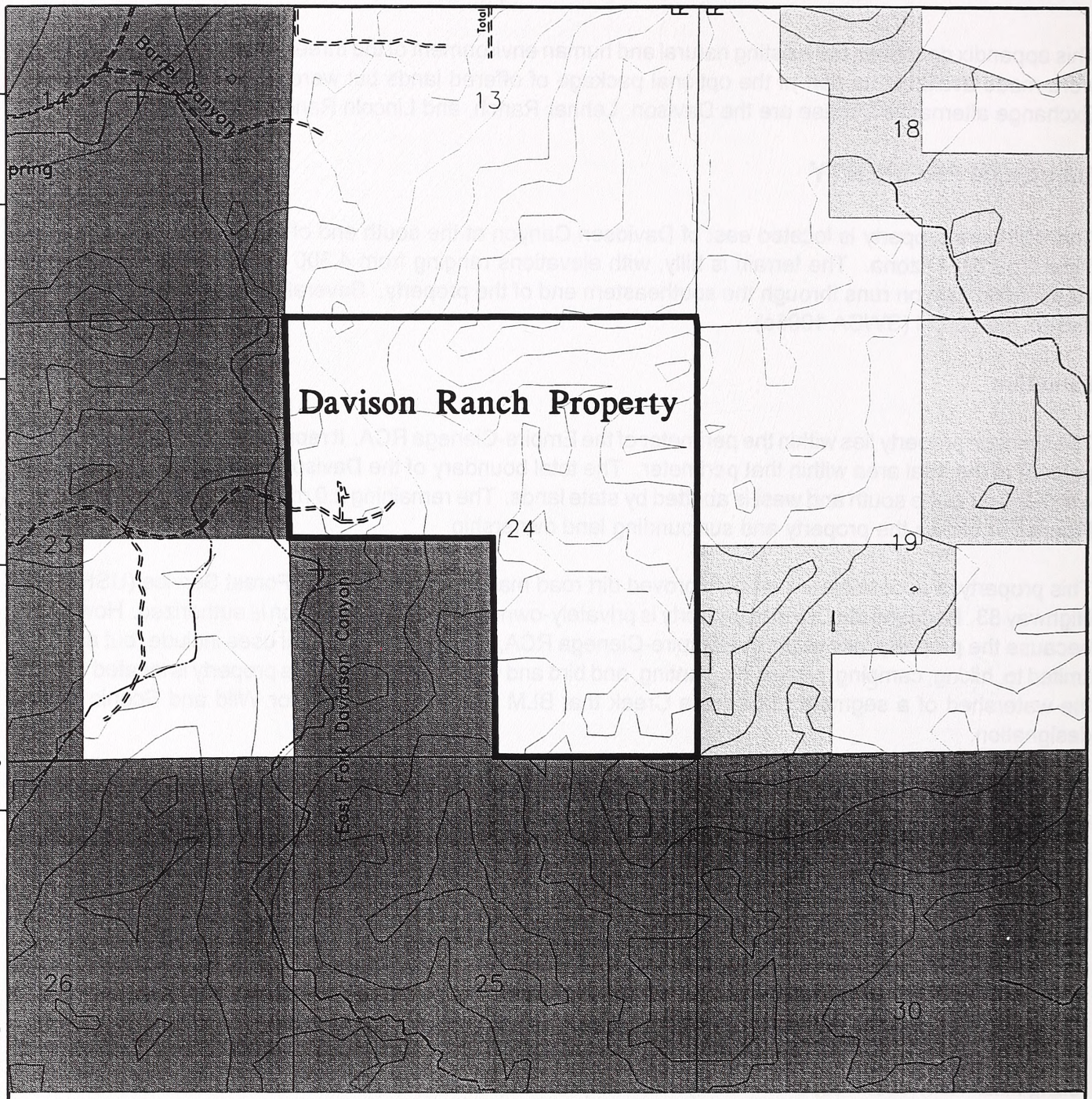
PD has let a grazing lease to this property that would be terminated upon completion of the realty transactions of the proposed land exchange. The property also includes a 160-acre State Land grazing lease that is being exercised by the leasee. Title to the property includes a Special Use Permit (Road) from the USFS. No other easements, rights-of-way, residential leases, or other encumbrances are associated with this property.

PD owns the subsurface estate (mineral rights). No surface water rights have been filed for this property.

No formal visual quality analysis has been completed for this property; however, natural resource elements of the area that define its visual quality include native grassland and woodland vegetation, and surrounding rolling hills. No Visual Resource Management Objectives (classes) have been established for the Empire-cienega RCA at this time (S. Knox, BLM, pers. comm.).

Physical Resources

The geological substrate is primarily bouldery outcrops and colluvium from the underlying Paleozoic and Mesozoic sedimentary and volcanic parent rocks of the Empire Mountains. The potential for occurrence of mineral resources on this property is summarized in Table E-1.

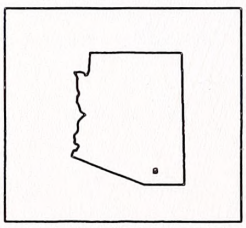


KEY

- DIRT ROADS
- EPHEMERAL DRAINAGES
- PROPERTY BOUNDARY
- BLM LAND
- STATE LAND
- PRIVATE LAND

Scale
0 1000 2000
FEET

LOCATION MAP



USGS 7.5' QUADRANGLE:
EMPIRE RANCH, ARIZ.

DOS POBRES/SAN JUAN PROJECT

Pima County, Arizona T.18S.,R.16E.

DAVISON RANCH PROPERTY
OFFERED LANDS

FIGURE E-1

Rev: 6-4-98
Date: 8-16-97
Chk'd by: TL
Drwn by: KAD/JLJ
Drawing: DAVISON.DWG
File: D:\Acad\Safford\OFF_LAND
Proj. #: 1700-M-21

Table E-1. Summary of Mineral Potential of the Davison Property

Mineral Resource	Potential	Level of Certainty
Coal, Oil & Gas, Sodium & Potassium	Low	C
Uranium & Thorium	Low	C
Geothermal Resources	Low	C
Locatable Metallic Minerals	Low (portions) Moderate (portions)	B
Non-Metallic Minerals/Industrial Minerals	Low	C
Common Variety Minerals (Sand & Gravel)	Low	C

Source: D.E. Wahl 1997

Biological Resources

The property's vegetation communities are ecotonal between Sonoran Desertscrub and Sonoran Desert Grassland biomes. Commonly observed species include lovegrass, fluffgrass, mesquite, ocotillo, Coahuila juniper, catclaw acacia, wait-a-minute bush, mortonia, fairyduster, and wolfberry. Cactus and succulent species present include prickly pear, fishhook cactus, Arizona rainbow cactus, cane cholla, Bisbee beehive cactus, flat cream pincushion, barrel cactus, Palmer agave, desert spoon, and banana yucca. The xeroriparian areas were dry during recent site visits, except for a few small rock pools that were present in February 1995. Xeroriparian vegetation is not well-developed as a distinct community throughout most of the property, but there are a few patches of riparian plants along the largest washes. These include desert broom, wolfberry, greythorn, netleaf hackberry, Fremont cottonwood, and Goodding willow. AGFD classified this parcel as Resource Category IV habitat (low resource value for wildlife) (SWCA 1995b).

Wildlife or sign observed included northern harrier, Cooper's hawk, mourning dove, common raven, great horned owl, white-throated woodrat, coyote, rock squirrel, ringtail, skunk, mule deer, and lizards. Wildlife is expected to be typical of the habitats represented on the property. Crinoid fossils were found in limestone rocks present on the site. Rock outcrops and cliff exposures along the principal washes appear to provide suitable nesting and roosting habitats for cliff-nesting birds, such as ravens and great horned owls, and several species of bats (SWCA 1995b).

Of 21 special interest species identified by federal and state agencies as potentially occurring on the Davison Ranch property, four are considered likely to occur with some regularity, 14 may occur occasionally, and the remaining three are unlikely to occur (Table E-2).

Cultural Resources

The Davison Ranch property has not been surveyed for cultural resources. No sites have been recorded there, however, a small site was observed during a recent reconnaissance of the property (SWCA 1995a). This artifact cluster is located on a sloping bench overlooking a deeply incised drainage; it includes more than five flakes and an unshaped handstone that is pecked and ground on one side. A tabular knife was noted a few tens of meters away, on the opposite side of the drainage.

Table E-2. Special Interest Species Potentially Occurring on the Davison Ranch Property

Species' Common Name	Scientific Name	Status*
Species Likely to Occur with Some Regularity		
American peregrine falcon	*Falco peregrinus anatum*	E, SS, WSCA
Mexican garter snake	*Thamnophis eques*	SS, WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	SS, WSCA
Fringed myotis	*Myotis thysanodes*	SS
Species That May Occur Occasionally		
Lesser long-nose bat	*Leptonycteris curasoae*	E, SS, WSCA
Wilcox fishhook cactus	*Mammillaria wrightii wilcoxii*	SS, SR
Bunchgrass lizard	*Sceloprous scalaris*	SS, WSCA
Desert tortoise	*Gopherus agassiz*	SS, WSCA
Huachuca golden aster	*Heterotheca rutteri*	SS
Canyon spotted whiptail	*Cnemidophorus burti*	SS
Mexican long-tongued bat	*Choeronycteris mexicana*	SS
California leaf-nosed bat	*Macrotus californicus*	SS
Small-footed myotis	*Myotis ciliolabrum*	SS
Yuma myotis	*Myotis yumanensis*	SS
Cave myotis	*Myotis velifer*	SS
Yellow-nosed cotton rat	*Sigmodon ochrognathus*	SS
Chiricahua western harvest mouse	*Reithrodontomys megalotis arizonensis*	SS
Pinaleno hedgehog cactus	*Echinocereus ledingii*	SR
Species Unlikely to Occur		
Ferruginous hawk	*Buteo regalis*	SS, WSCA
Long-legged myotis	*Myotis volans*	SS
Allen's lappet-browed bat	*Idionycteris phyllotis*	SS

* Status Key: E = Federal Endangered; SS = BLM Special Status; WSCA = Wildlife of Special Concern in Arizona (AGFD 1996); SR = Salvage Restricted under Arizona Native Plant Law.
Source: SWCA 1995b.

Although no sites have been recorded within a mile or so of the Davison Ranch property, several dozen sites have been recorded 2 -5 mi to the west, in the Santa Rita Mountains. They include Archaic period hunting-and-gathering sites, Hohokam (Formative period) habitations, and Historical period sites (Ferg et al. 1984; Huckell 1984). The Archaic sites are in hilly country like that of the Davison property, which would suggest that similar, archaeologically significant Archaic sites could be found on the property. The small site discovered during the reconnaissance visit may, for example, date to the Archaic period. Historical period mining sites may be present as well (SWCA 1995a).

Socioeconomic Resources

The Davison property generated $499.72 in private property taxes for Pima County in 1996. Currently there is a grazing lease that generates roughly $150/lease-year for PD.

LEHNER RANCH PROPERTY

This 60-acre property is situated on the floodplain of the San Pedro River about one mile south of the community of Hereford in Cochise County, Arizona. Elevation varies little, averaging about 4,200 ft above msl (Zenitech 1997). Several small, entrenched arroyos drain the property to the east.

Land Use

The Lehner Ranch property is owned by PD but lies within the perimeter of one of Arizona's two congressionally-designated Riparian National Conservation Areas (RNCAs), the San Pedro RNCA. This 56,100-acre, 36-mi -long RNCA is recognized by BLM for its richness in scenic, historic, prehistoric cultural resources, wildlife, riparian, and recreational values. Additionally, the RNCA is listed in the recovery plan for the endangered northern Aplomado falcon as a potential release site for reestablishment of the species. The Lehner Ranch property appears to have some characteristics that might make it suitable for this species.

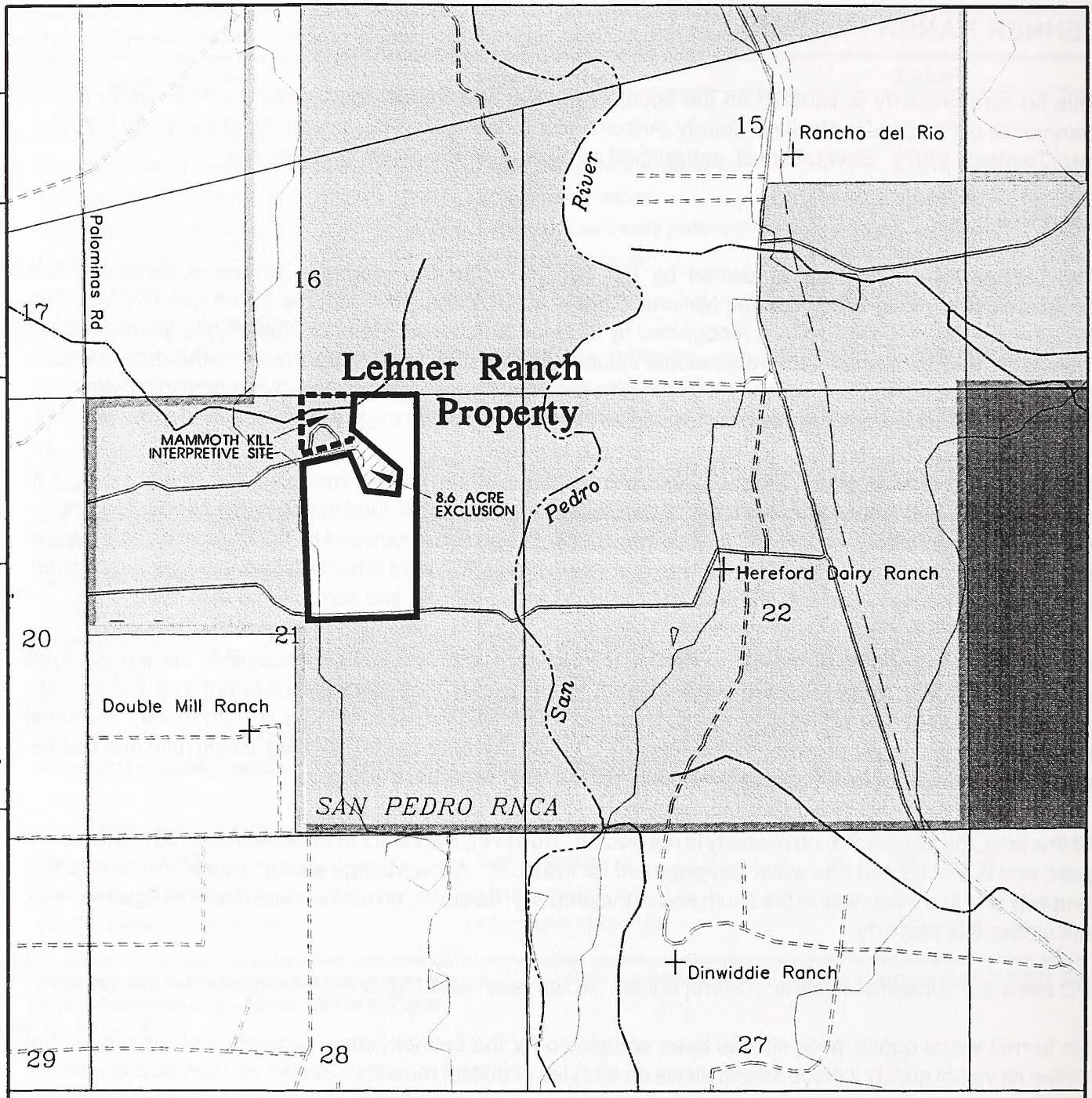
This property, one of about a dozen private inholdings within the perimeter of the RNCA, is nearly surrounded by public land administered by the BLM. Adjoining public land includes the Lehner Mammoth Kill Site National Historic Landmark, an important cultural resource developed by the BLM as an interpretive site. Adjoining non-public land is limited to a single, private, 8.7-acre inholding that includes the original Lehner ranch house. Figure E-2 shows the Lehner Ranch property and surrounding land ownership.

Located near the southern end of the RNCA, the Lehner Ranch property is accessible via the dirt road leading to the Mammoth Kill Interpretive Site off of the county road between Hereford and Palominas, Arizona. Because the property is privately-owned, no public recreational use is authorized. Potential recreational uses on this property might include, but would not be limited to, camping, hiking, bird and wildlife watching, environmental education and interpretation, and horseback riding.

At this time, the Lehner Ranch property is not grazed. However, it appears to have been grazed in the recent past, and is fenced and has water development for livestock. A low-voltage electric power line runs to the property and to a water well at the south end of the property; however, no utilities easements or rights-of-way encumber this property.

PD owns the subsurface estate (mineral rights). No surface water rights have been filed for this property.

No formal visual quality analysis has been completed for the Lehner Ranch property, but resources that define its visual quality include scenic views on all sides of distant mountain ranges as seen across a broad expanse of grassland. Toward the east, the grassland is broken by the linear cottonwood-willow forest that snakes along the San Pedro River. The visual quality of the property itself is characterized by moderately vegetated, flat terrain with some entrenched gullies. Human modifications include a dry, man-made pond; an irrigation pump; and irrigation canals. According to the San Pedro River Riparian Management Plan and Environmental Impact Statement (Final) (p. 34), "Designation of visual resource management classes has not occurred on the public lands in the San Pedro EIS area." However, BLM-administered lands in the immediate vicinity of the Lehner Ranch property, like the property itself, have been previously disturbed and would most likely meet the criteria for VRM Class III (D. Morgan, BLM Sierra Vista Field Office, pers. comm. 1997). The management objective of Class III is to *partially retain* the existing character of the landscape. Management activities may attract attention but should not dominate the view of the casual observer. Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape (BLM 1991, 1994b).



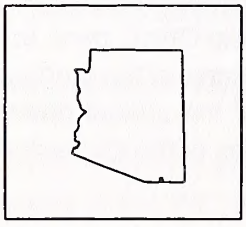
KEY

- ROADS
- DIRT ROADS
- MAJOR DRAINAGE
- EPHEMERAL DRAINAGES
- PROPERTY BOUNDARY
- RNCA BOUNDARY
- MAMMOTH KILL INTERPRETIVE SITE
- BLM LAND
- STATE LAND
- PRIVATE LAND

N

Scale
0 1000 2000
FEET

LOCATION MAP



USGS 7.5' QUADRANGLE:
HEREFORD, ARIZ.

DOS POBRES/SAN JUAN PROJECT
Cochise County, Arizona T.20S.,R.18E.

LEHNER RANCH PROPERTY
OFFERED LANDS

FIGURE E-2

Proj. #: 1700-M-21 | File: D:\Acad\Safford\DFF_LAND | Drawing: LEHNER.DWG | Drawn by: KAD/JLJ | Chk'd by: TL | Date: 8-16-97 | Rev: 6-4-98

Physical Resources

The Lehner Ranch property consists primarily of Holocene to latest Pleistocene alluvial and fluvial deposits derived in pan from late Paleozoic sedimentary rocks from mountain ranges bordering the San Pedro Valley. Observations from on-site examination of surface soils indicated fine-grained fluvial material, predominantly sands and silts (Zenitech 1997). The potential for the occurrence of mineral resources on this property is summarized below in Table E-3.

Table E-3. Summary of Mineral Potential of the Lehner Ranch Property

Mineral Resource	Potential	Level of Certainty
Coal, Oil & Gas, Sodium & Potassium	Low	C
Uranium & Thorium	Low	C
Geothermal Resources	Low	C
Locatable Metallic Minerals	Low	C
Non-Metallic Minerals/Industrial Minerals	Low	C
Common Variety Minerals (Sand & Gravel)	Low	B

Source: D.E. Wahl 1997

Biological Resources

Vegetation on the Lehner Ranch property is characteristic of an old field or pasture that is recovering with native vegetation and will become either grassland or mesquite bosque. The original condition of the property was probably sacaton grassland or mesquite bosque, possibly some of both, which can be classified as Semidesert Grassland, *Sporobolus wrightii-Prosopis juliflora* Association. It includes, on the east half, a currently inactive irrigated field or pasture that has been succeeded by a mixture of native grasses, some non-native species, and several species of forbs. Small mesquite trees (<6 ft tall) and some white-thorn acacia dot the pasture. The west half of the property is a dense grove of small (10-15 ft tall), young mesquite trees forming a young bosque grading out into the pasture. Most of the plant species occurring in the pasture also are in the bosque, in openings between or under trees. Species observed included mesquite, sacaton, white-thorn acacia, Rothrock grama grass, devils-claws, narrow-leafed yucca, Palmer amaranth, crabgrass, range ratany, summer poppy, buffalo-gourd, silverleaf nightshade, morning glory, horse-purslane, wooly tidestromia, Russian thistle, three-awn grasses, desert broom, cane cholla, castor bean, desert zinnia, plains bristlegrass, and other grasses (SWCA 1996d).

No clear demarcation of species is evident between bosque and pasture, but relative density and size gradually changes, with mesquites becoming denser and larger west of the irrigation ditch. No distinct primary natural riparian or upland community exists on the property. The entire property appears to have been disturbed by human activities in the past. Remains of large dead cottonwood trees are present around the dry pond and their location suggests that they were intentionally planted. Plant species observed at the pond include bulrush, jungle rice, spikerush, Fremont cottonwood, and desert broom, most of which were dead or dying for lack of water (SWCA 1996d).

There are no natural wetlands on the property. The dry, artificial pond may be interpreted as a man-made former wetland. Although it apparently has not held water for some time and its only apparent source of

water is a well, remnant vegetation and soils appear to be characteristic of ponds and wetlands (SWCA 1996d).

Wildlife observed included desert grassland whiptail, desert spiny lizard, desert box turtle, eastern fence lizard, curve-billed thrasher, mourning dove, northern cardinal, northern mockingbird, vermillion flycatcher, song sparrow, red-tailed hawk, house finch, Gila woodpecker, Gambel's quail, loggerhead shrike, collared peccary, round-tailed ground squirrel, coyote, and white-throated woodrat (SWCA 1996d).

Of 21 special interest species identified by federal and state agencies as potentially occurring on the Lehner Ranch property, one is considered likely to occur with some regularity, 14 may occur occasionally, and the remaining six are unlikely to occur (Table E-4).

Cultural Resources

Archaeologists were first drawn to the Lehner Ranch in 1952 after the discovery of deeply buried bones by the rancher. Excavations uncovered one of the most extensive Clovis Culture sites ever documented (Haury, Sayles, and Wasley 1959). The portion of the ranch containing the site is now administered by the BLM as the Lehner Mammoth Kill Site National Historic Landmark. In 1968, most or all of the ranch was included in the survey area for the proposed Charleston Reservoir. Although Kayser (1968:1) describes the Charleston survey as "an intensive search for all possible sites," by today's standards the study would probably qualify as a reconnaissance. The Charleston study located two sites near the offered property. During a recent visit to the property, archaeologists noted one site (a large area of fire-cracked rock in association with lithic artifacts) and three isolated artifacts (a San Pedro point from the Late Archaic period, a plainware sherd, and a concentration of fire-cracked rock about three ft in diameter) (SWCA 1996a). The potential for significant archaeological remains on the property is good.

Socioeconomic Resources

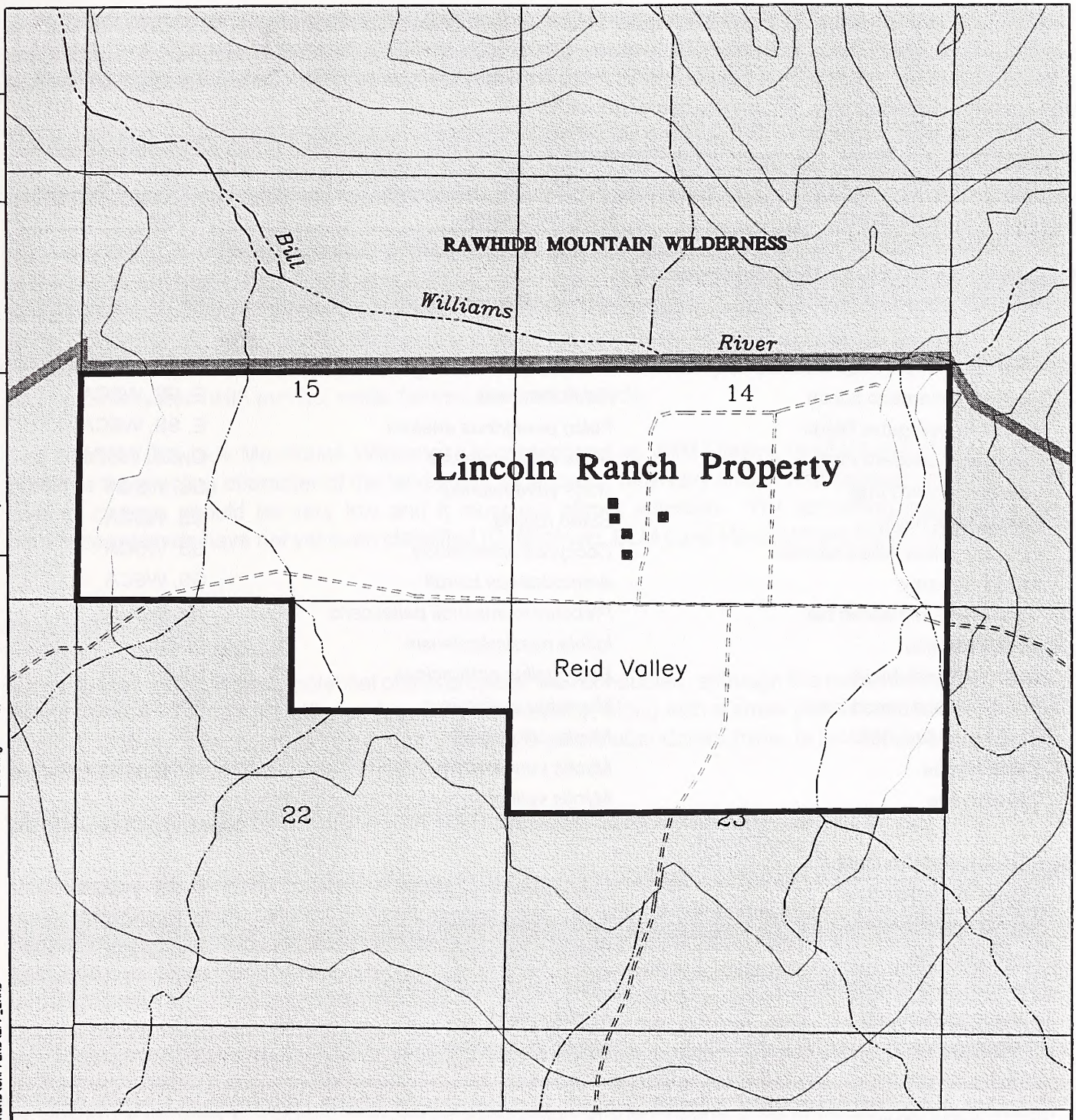
The Lehner property, taxed as Vacant Land, generated $2,456 in private property taxes for Cochise County in 1996. Currently, no grazing leases have been signed for this property.

LINCOLN RANCH PROPERTY

This property consists of 1,002 acres south of the Bill Williams River in La Paz County in western Arizona. It occupies much of Reid Valley, a pocket of nearly level to gently sloping, primarily agricultural land surrounded by badlands. Elevations range from 860 to 1,060 ft above msl.

Land Use

The property is completely surrounded by BLM-administered public land, borders the BLM's 38,470-acre Rawhide Mountains Wilderness, and is approximately six miles downstream of Alamo Lake State Park. Resource values of the Wilderness include a predominantly natural environment with human imprints largely unnoticeable, a highly productive riparian wildlife habitat, and scenery characterized by colorful bluffs and riparian vegetation. The BLM manages the Wilderness to provide for the long-term protection and preservation of the area's wilderness character. Specific management objectives include providing opportunities for solitude and primitive and unconfined recreation, including hiking, backpacking, river running, birdwatching, sightseeing, and photography (C. Bobinski, BLM Lake Havasu Field Office, pers. Comm. 1997). Figure E-3 shows the property in relation to surrounding land ownership.



KEY

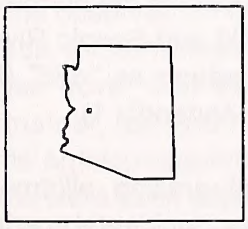
- BUILDING
- DIRT ROADS
- PROPERTY BOUNDARY
- MAJOR DRAINAGE
- EPHEMERAL DRAINAGES
- WILDERNESS BOUNDARY
- BLM LAND
- PRIVATE LAND

Scale

0 1000 2000

FEET

LOCATION MAP



USGS 7.5' QUADRANGLE:
REID VALLEY, ARIZ.

DOS POBRES/SAN JUAN PROJECT

La Paz County, Arizona T.10N.R.14W.

LINCOLN RANCH PROPERTY
OFFERED LANDS

FIGURE E-3

Rev: 6-4-98 | Date: 8-15-97 | Chk'd by: TL | Drawn by: KAD/JLJ | Drawing: LINCOLN.DWG | File: D:\ACAD\SAFFORD\OFF_LAND | Proj. #: 1700-M-21

This property is accessible via two public roads: 1) Lincoln Ranch Road, a county-maintained road that runs north, northeast from the community of Bouse (on State Highway 72), a distance of about 30.0 mi; and 2) a four-wheel drive dirt road that follows the El Paso Natural Gas Line northwest from the community of Wenden (on U.S. Highway 60), a distance of about 35 mi.

Table E-4. Special Interest Species Potentially Occurring on the Lehner Ranch Property

Species' Common Name	Scientific Name	Status*
Species Likely to Occur with Some Regularity		
Northern gray hawk	*Buteo nitidus maximus*	SS
Species That May Occur Occasionally		
Northern aplomado falcon	*Falco femoralis*	E, SS, WSCA
American peregrine falcon	*Falco peregrinus anatum*	E, SS, WSCA
Chiricahua Leopard Frog	*Rana chiricahuensis*	C, SS, WSCA
Lowland leopard frog	*Rana yavapaiensis*	SS, WSCA
Ferruginous hawk	*Buteo regalis*	SS, WSCA
Western yellow-billed cuckoo	*Coccyzus americanus*	SS, WSCA
Baird's sparrow	*Ammodramus bairdii*	SS, WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	SS, WSCA
Mississippi kite	*Ictinia mississippiensis*	SS
Common black-hawk	*Buteogallus anthracinus*	SS
California leaf-nosed bat	*Macrotus californicus*	SS
Small-footed myotis	*Myotis ciliolabrum*	SS
Yuma myotis	*Myotis yumanensis*	SS
Cave myotis	*Myotis velifer*	SS
Species Unlikely to Occur		
Lesser long-nosed bat	*Leptonycteris curasoae*	E, SS, WSCA
Mexican garter snake	*Thamnophis eques*	SS, WSCA
Desert tortoise	*Gopherus agassiz*	SS, WSCA
Mexican long-tongued bat	*Choeronycteris mexicana*	SS
Long-legged myotis	*Myotis volans*	SS
Fringed myotis	*Myotis thysanodes*	SS

* Status Key: E = Federal Endangered; C = Federal Candidate; SS = BLM Sensitive Species; WSCA = Wildlife of Special Concern in Arizona (AGFD 1996).
Source: SWCA 1996d.

Because the property is privately-owned, no recreational uses are authorized. Potential public recreational uses include, but are not limited to, hiking, backpacking, river-running, birdwatching, and photography. Three segments of the Bill Williams River (totalling 19 mi) flowing just north of and parallel to the northern boundary of this property have been recommended for inclusion in the National Wild and Scenic River System. These segments, which total 4,650 acres, are recommended for designation as "wild" (M. Henderson, BLM Havasu Field Office, pers. comm. 1996; Wild & Scenic Rivers EIS, Appendix 1).

The Lincoln Ranch property falls within the Primrose allotment, an ephemeral grazing allotment encompassing 106,569 acres. The property has not been grazed for at least eight years. Incidental grazing likely occurs, as wild burros roam the adjacent federal lands, and the property is not completely fenced. The

primary land use currently is and historically has been agriculture, particularly cotton production. Other encumbrances associated with this property include a gas main easement with access road for El Paso Natural Gas Company (PD 1996).

The subsurface mineral rights are owned by the Santa Fe Pacific Railroad and two former property owners. Two surface water rights, each for 7,500.0 af/yr from Bill Williams River, have been filed for this property by PD Corporation, respectively, for irrigation purposes.

No formal visual quality analysis was completed for this property; however, some natural resource elements of the property which define its visual quality include irrigated cotton fields, rugged mountain landscapes, steep hillsides dotted with saguaro cacti, and views of adjoining riparian vegetation along the Bill Williams River. Evidence of human modification on the property is extensive. In addition to the fields, the property contains several ranch buildings, including residences, a barn, and various outbuildings; a corral complex; an irrigation system with pumps; wells; fences; and ranch roads.

The adjacent Rawhide Mountains Wilderness is categorized as VRM Class I, in which the objective is to preserve the existing character of the landscape by allowing only very limited management activity. The level of change should be very low and it must not attract attention. The remaining adjacent BLM-administered lands have not yet been classified (C. Bobinski, BLM Lake Havasu Field Office, pers. Comm. 1997).

Physical Resources

No evaluation of the mineral potential of this property was conducted, although the remains of a stamp mill dating between 1920 and 1945 was found on the property, along with a small pile of copper-bearing ore (SWCA 1996a). The apparent source of that ore, a small, abandoned mine, is located just outside the property boundary.

Biological Resources

Vegetation on the property consists primarily of irrigated cotton fields and fallow, abandoned fields. Along major irrigation ditches, tall Fremont cottonwood trees provided windbreaks and wildlife habitat. Dense hedges of mesquite, tamarisk, blue paloverde and catclaw acacia surround most of the fields on the south, east, and west sides along fences. Mesquite, lens scale, catclaw acacia, desert ironwood, desert willow and burro brush are abundant in undisturbed flats and washes, forming a Mesquite-mixed tree Association. The original native vegetation over most of the flat is gone. Most likely it was either a Mesquite-mixed tree Xeroriparian Woodland Association or, at least in part, a Cottonwood-willow Riparian Woodland Association grading into Mesquite-mixed tree Xeroriparian Woodland. Vegetation on the surrounding ridges is typical of western examples of Saguaro-Paloverde association of the Arizona Upland division of the Sonoran Desertscrub biome. Plant species observed in this association included saguaro, foothills paloverde, creosote bush, ocotillo, barrel cactus, teddy bear cholla, buckhorn cholla, beavertail cactus, brittlebush, range ratany, white bursage, and hedgehog cactus (SWCA 1996d).

Wildlife observed on the property included western whiptail lizard, house sparrow, mourning dove, black phoebe, western kingbird, house finch, red-winged blackbird, brown-headed cowbird, Gambel's quail, white-winged dove, Gila woodpecker, western kingbird, ladder-backed woodpecker, purple martin, greater roadrunner, red-tailed hawk, turkey vulture, northern harrier, black-tailed jackrabbit, desert cottontail, and Harris' antelope squirrel. Tracks, droppings, and feeding damage of feral burros were abundant, and several burros were seen adjacent to the property. Bat droppings on a building porch indicate that this structure is frequently used as a night roost, probably by pallid bats (SWCA 1996d).

Of 18 special interest species identified by federal and state agencies as potentially occurring on the Lincoln Ranch property, none are considered likely to occur with some regularity, 16 may occur occasionally, and the remaining two are unlikely to occur (Table E-5).

Cultural Resources

Based on an ASM files check, no intensive surveys and no recorded archaeological sites are known within one mile of the Lincoln Ranch property. Results from archaeological projects in the general area (e.g., Rogge 1994) indicate that sites tend to be sparse in this part of Arizona. During a recent, brief archaeological reconnaissance, one Historical period site (the stamp mill and an associated ditch) on the property and one just off the property (the mine complex) were noted and considered to be eligible for inclusion in the National Register (SWCA 1996a). The ranch headquarters may also include elements that are of historical and architectural interest.

Socioeconomic Resources

This property, taxed Agricultural/Ranch land, generated $3,602 in private property taxes for La Paz County in 1996. Currently, there is an agricultural lease agreement in place for this property that yields $30,000 per lease-year to PD.

Table E-5. Special Interest Species Potentially Occurring on the Lincoln Ranch Property

Species' Common Name	Scientific Name	Status*
Species That May Occur Occasionally		
American peregrine falcon	*Falco peregrinus anatum*	E, SS, WSCA
Southwestern willow flycatcher	*Empidonax traillii extimus*	E, SS, WSCA
Bald eagle	*Haliaeetus leucocephalus*	T, SS, WSCA
Lowland leopard frog	*Rana yavapaiensis*	SS, WSCA
Desert tortoise	*Gopherus agassiz*	SS, WSCA
Ferruginous hawk	*Buteo regalis*	SS, WSCA
Yellow-billed cuckoo	*Coccyzus americanus*	SS, WSCA
Townsend's big-eared bat	*Plecotus townsendii pallescens*	SS, WSCA
Western red bat	*Lasiuris blossevillii*	SS, WSCA
Common black-hawk	*Buteogallus anthracinus*	SS
Snowy egret	*Egretta thula*	SS
Belted kingfisher	*Ceryle alcyon*	SS
Yuma myotis	*Myotis yumanensis*	SS
Cave myotis	*Myotis velifer*	SS
Spotted bat	*Euderma maculata*	SS
Allen's lappet-browed bat	*Idionycteris phyllotis*	SS
Species Unlikely to Occur		
Small-footed myotis	*Myotis ciliolabrum*	SS
Long-legged myotis	*Myotis volans*	SS

* Status Key: E = Federal Endangered; T = Federal Threatened; SS = BLM Sensitive Species; WSCA = Wildlife of Special Concern in Arizona (AGFD 1996); SR = Salvage Restricted under Arizona Native Plant Law.
Source: SWCA 1996d.

APPENDIX F

DRAFT MITIGATION AND MONITORING PLAN

Dos Pobres/San Juan Project

DRAFT MITIGATION AND MONITORING PLAN

Prepared for:

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May 1998
Job No. 97201-G-002

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1. INTRODUCTION

This document summarizes Phelps Dodge Safford, Inc.'s (PDSI) plan to mitigate for potential impacts to waters of the United States[1] (also referred to as jurisdictional waters in this document) and water resources that would result from development of the proposed Dos Pobres/San Juan Project (the Project). The final Habitat Mitigation and Monitoring Plan (HMMP) will include detailed implementation plans and will be published in the Final Environmental Impact Statement (FEIS).

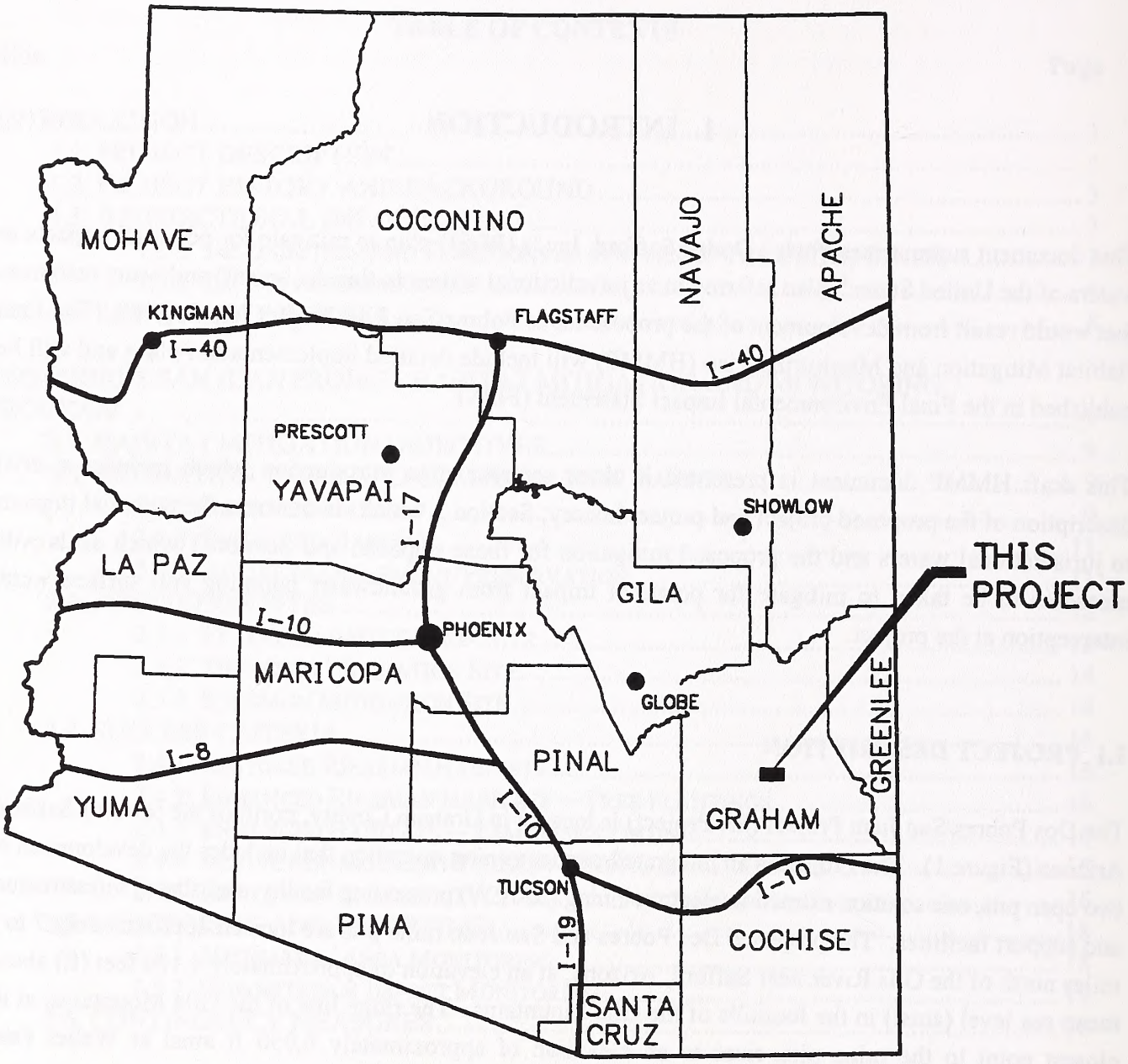
This draft HMMP document is presented in three sections; this Introduction which includes a brief description of the proposed project and project history; Section 2 which summarizes the potential impacts to jurisdictional waters and the proposed mitigation for those impacts; and Section 3 which deals with measures to be taken to mitigate for potential impact from groundwater pumping and surface water interception at the project.

1.1 PROJECT DESCRIPTION

The Dos Pobres/San Juan Project (the Project) is located in Graham County, north of the town of Safford, Arizona (Figure 1). The Project is an integrated copper mining operation that includes the development of two open pits, one solution extraction/electrowinning (SX/EW) processing facility, and shared infrastructure and support facilities. The proposed Dos Pobres and San Juan mine pits are located approximately 7 to 8 miles north of the Gila River near Safford, Arizona, at an elevation of approximately 4,100 feet (ft) above mean sea level (amsl) in the foothills of the Gila Mountains. The ridge line of the Gila Mountains, at its closest point to the mine pits, rises to an elevation of approximately 6,050 ft amsl at Weber Peak approximately 2.5 and 1.5 miles east of the Dos Pobres and San Juan pits, respectively.

Based upon the current Plan of Operations, the Project will produce approximately 2.9 billion pounds of salable copper over the project's estimated 16-year production life. Project production will include the mining of 626 million tons of oxide and sulfide leach ore, and 385 million tons of lower grade and unmineralized material generally referred to as development rock. Total mineable material amounts to 1.01 billion tons, resulting in a 0.6:1.0 non-ore to ore ratio. Construction of the SX/EW plant, crushing and

[1] Waters of the United States, as used in the context of this document, refers to areas of the Corps' jurisdiction, as defined at 33 CFR, Part 328.3(a)(1-7). It does not refer to wet water that may be from time to time transported by the normally ephemeral washes.



Safford District

Habitat Mitigation Bank

LOCATION MAP

Phelps Dodge Safford, Inc.

DESIGNED BY: GGF	DRAWN BY: GGF	CHECKED BY: JAT	FIGURE
DATE JUNE 1, 1998	PROJECT NO. 0201-02-835	SCALE: N.T.S.	1
WESTLAND RESOURCES DRAWING PATH WESTLAND\PROJECTS\0201-2\PD-GMD\LOC-MAP.DWG			

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N

N.T.S.

material handling system, and associated support facilities will require approximately 15 months to complete and will start after completion of the Project's environmental permitting requirements and final authorization by the Board of Directors of Phelps Dodge Corporation. Approximately 3,300 acres of land will be directly impacted by proposed mine features. These impacts will occur on a combination of private and publicly owned lands. Should the land exchange alternative being considered by the BLM in their Dos Pobres/San Juan Project Environmental Impact Statement be selected, the proposed action will occur entirely on privately held lands.

1.2 PROJECT HISTORY AND BACKGROUND

In 1994, PDSI proposed the Safford Land Exchange with the Bureau of Land Management (BLM) for the purpose of consolidating PDSI's property holdings in the Safford Mining District. Through the proposed land exchange, PDSI would acquire public lands (referred to as the Selected Lands) within and adjacent to its existing private property in the District in exchange for other lands (referred to as the Offered Lands) in Arizona currently owned by PDSI. Initial scoping for the Safford Land Exchange occurred during the fall of 1994.

During this process, two separate events occurred; PDSI was made aware of the U.S. Army Corps of Engineers' (COE) likely requirement of an Environmental Impact Statement (EIS) as a component of the COE's public interest review under Section 404 of the Clean Water Act (CWA), and PDSI's development of the mine plan progressed such that they were able to define a specific project and development schedule. In response to these events, PDSI submitted a Mining Plan of Operations (MPO) to the BLM in May 1996 pursuant to the General Mining Law of 1872 and its implementing regulations at 43 Code of Federal Regulations (CFR) Section 3800, Subpart 3809. The MPO describes the proposed Dos Pobres/San Juan Project.

PDSI is continuing to pursue the land exchange as an alternative to BLM's authorization of the Dos Pobres/San Juan Project MPO.

1.3 JURISDICTIONAL IMPACTS

1.3.1 DISTRIBUTION AND FUNCTIONS OF WATERS OF THE UNITED STATES

Between the proposed mine site and the Gila River is a broad, gently sloping plain. Vegetation in the uplands of this area is characteristic of Sonoran Desert Scrub habitats and is dominated by broad creosotebush flats. As the project area increases in elevation towards the Gila Mountains, upland vegetation communities gradually transition to Semidesert Grassland Habitat types.

Drainage patterns in the project area are characterized in many places by braided channel systems or sheet flow and in other areas drainage patterns are dendritic. All of the drainages in the project area are ephemeral

washes and the primary drainages report to the Gila River just north of Safford. The primary drainages within the project area, from east to west, are Wilson Wash, Peterson Wash, Cottonwood Wash, Talley Wash, Watson Wash, and Coyote Wash. In the vicinity of the project area, there are three springs (Cottonwood, Hackberry, and Bryce), and one small seep referred to as DP Seep. The springs are outside of the footprints of disturbance for the proposed project, while DP Seep is within the footprint of the proposed Dos Pobres pit.

Table 1 summarizes vegetation characteristics within the project area. Xeroriparian vegetation in the project area is generally open and patchily distributed. As is typical with xeroriparian vegetation, most of the plant species present also occur in upland habitats, though in xeroriparian habitats they typically occur at higher densities and/or generally in larger sizes. Total vegetation volume (TVV) in washes in the project area typically ranges from 0.25 to 0.65 m^3/m^2 and averages approximately 0.45 m^3/m^2. In comparison, upland habitats on this property have vegetation volume of from 0.1 to 0.33 m^3/m^2 and averaged approximately 0.24 m^3/m^2.[2] Xeroriparian areas have been qualitatively assigned to three categories based upon apparent channel width identified from available aerial photography. Category 1 xeroriparian areas, the widest channels, supported the lowest vegetation volumes (mean = 0.31 m^3/m^2). Category 2, intermediate channel widths, and category 3, the narrowest channel widths, supported nearly identical amounts of vegetation (average values are 0.46 m^3/m^2 and 0.47 m^3/m^2, respectively). Creosotebush, not normally considered to be a riparian plant, comprised 30.4 percent, 23.0 percent, and 33.9 percent of the total vegetation volume in the category 1, 2, and 3 xeroriparian areas, respectively. Other dominant plant species in the xeroriparian habitats that occur within the project area included catclaw acacia, mesquite, blue paloverde, whitethorn acacia, and burroweed.

Wetlands located at Cottonwood and Bryce springs will not be directly impacted by the proposed action and their position, relative to geologic faults in the project area, suggest that they would not be impacted by groundwater pumping at the mine (R. Mac Nish, personnel communication, 25 March 1998). DP Seep, which lies within the footprint of the proposed Dos Pobres pit would be impacted. There are no jurisdictional wetlands associated with this seep. Other springs in the vicinity of the project area include Hackberry Spring and Walnut Spring. These springs will not be directly impacted by the proposed project and do not have jurisdictional wetlands associated with their surface-water discharge.

An evaluation of the functions generally attributed to waters of the United States and their applicability to waters impacted by this project is provided in Table 2.

[2] For comparison, well vegetated, upland Sonoran Desert Scrub habitat in Northwest Tucson will typically have TVV slightly greater than 0.5 m^3/m^2; Mesquite Bosques typically exceed 1.5 m^3/m^2; and mature Cottonwood/Willow riparian habitats typically exceed 3.0 m^3/m^2.

Table 1. Dominant Plant Species Within Xeroriparian Habitats and Adjacent Upland Habitats in the Project Area

	Xeroriparian Habitat			
	Category 1	**Category 2**	**Category 3**	**Upland**
No. Transects	21	61	92	36
No. Points	702	894	629	720
No. Washes or Areas	5	11	13	9
Mean Width (m)	66.8	29.4	13.6	Na
Mean Vegetation Volume	0.31	0.46	0.47	0.24
		Percent Dominance		
Creosotebush	30.4%	23.0%	33.9%	63.3%
Mesquite	11.3%	22.0%	4.8%	1.2%
Catclaw Acacia	14.3%	21.4%	10.1%	0.7%
Whitethorn Acacia	5.1%	4.4%	20.7%	0.6%
Blue Paloverde	8.7%	6.5%	10.1%	0.8%
Burroweed	14.1%	4.1%	2.8%	0.6%
Desert Broom	6.7%	2.9%	0.6%	0.0%
Snake Weed	1.3%	2.3%	3.2%	3.7%
Prickly Pear	0.0%	0.0%	< 0.1%	5.6%
Perennial Grasses	1.0%	4.0%	7.1%	16.5%
All Other Species	7.1%	9.4%	6.7%	7.0%

1.3.2 IMPACT ASSESSMENT

The project will directly impact 21.4 acres of waters of the United States. An additional 93.2 acres of jurisdictional waters will be impacted due to stormwater diversions and mine development activities that reduce contributing watershed areas of the downstream washes. The total acreage affected is 114.6. Determination of the extent of downstream impacts associated with dewatering is based upon the recovery of channel flows to their pre-disturbance peak flow for the 100-year storm event (Q_{100}) at the downstream extent of direct impacts.

For areas subjected to direct impacts, the functions associated with those waters are assumed to be completely lost. For jurisdictional waters indirectly impacted by stormwater diversion, the functions provided by these drainages will not be completely lost, they will still convey stormwater and maintain habitats of higher function than the adjacent uplands. To determine the acreage of mitigation required for impacted waters based upon impacted functions, we assumed that the maximum impact at any point within areas of indirect impact would be 50 percent. This estimate is based upon the professional judgement of the wildlife resource agencies evaluating project impacts and was determined after review of the characteristics of the resources impacted and the nature of the downstream effects.

Table 2. Functions Evaluation of Jurisdictional Waters of the United States at the Dos Pobres/San Juan Project

Energy/nutrient cycling —The drainages that will be impacted by the proposed Dos Pobres/San Juan project are ephemeral and do not contain aquatic resources that would be dependent upon allochthonous inputs to establish and maintain the energy and nutrient dynamics of these systems. Existing downstream energy inputs from the project area to the Gila River are not expected to be significant in light of the size of the Gila River watershed relative to the nature of impacts associated with this project. Desert streams depend more on nutrient inputs from surrounding land than from upstream inputs. Even this input is small compared to mesic situations. Due to the general lack of retention devices in desert streams (e.g. snags) upstream materials tend to get washed far downstream or caught in the adjacent floodplain (Fisher 1986, p.124). The nature of xeroriparian habitats associated with jurisdictional waters at and immediately downstream of the project site are such that they are not expected to be dependent upon energy or nutrient inputs from the project area. Almost all of the species found within these habitats are also found in adjacent uplands, and many of the dominant species are able to fix nitrogen. These systems are not expected to provide significant nutrient cycling and energy functions to adjacent upland or downstream habitats.
Habitat function (nesting, feeding, spawning, rearing and resting sites for aquatic or land species) — There is no perennial water to support aquatic species or habitats within the jurisdictional drainages directly impacted by the proposed facilities or indirectly impacted by diversion of surface water flows for stormwater management activities. Habitat functions along these jurisdictional drainages are provided by the xeroriparian habitats adjacent to jurisdictional waters that have been described in detail elsewhere. Within the project area, these habitats support a variety of common, terrestrial wildlife species, many of whom utilize both xeroriparian and adjacent upland habitats. There will be direct impacts to these functions in areas subject to excavation and fill activities. There is potential for some impact to habitat functions of drainages below the project site from surface water diversions. This impact would be a direct result of potential reductions in vegetation biomass and structure and species composition as a consequence of reduced water availability. These impacts are expected to be minor -- we currently hypothesize that these habitats are maintained by the surface runoff from adjacent uplands and are not dependent upon the ephemeral flows generally in the upper watershed that occasionally generate discharge to the Gila River. As a consequence, impacts to downstream habitat functions, if any, are expected to be minor.
Hydrologic functions - stormwater transport — This is a function of the waters of the United States impacted by the Dos Pobres/San Juan Project. The drainages impacted by the proposed project collect and transport stormwater; they are normally dry except during and immediately after local or regional precipitation events. Potential impacts of the adjacent stormwater drainage system to convey stormwater to the Gila River from areas upgradient of the mine will be mitigated by construction of proposed stormwater diversion facilities. Within the mine facilities, stormwater will be managed to ensure that there are no discharges from the mine. Changes in stormwater transport are summarized in the DEIS and described in detail in the stormwater management master plan for the project.
Hydrologic functions - sediment transport — This is a function of waters of the United States impacted by the Dos Pobres/San Juan Project. The natural drainage system within the project area collects and transports sediment during the periods of time when water flows in the channel (during and immediately following precipitation events). Following construction of the proposed stormwater diversion system and other mine related facilities for the Dos Pobres/San Juan Project, sediment transport of the existing drainage system will be impacted. Impacts include increased scour potential at the discharge points of the diversion channels and removal of potential bed load material as a result of construction of the diversions and other stormwater management facilities. Impacts from alteration of sediment transport processes were considered in the design of the stormwater diversion and adverse impacts from excessive channel degradation were included in the assessment of direct impacts to jurisdictional waters. Changes in the sediment transport characteristics associated with project development have been summarized on the DEIS and are presented in detail in the stormwater management master plan for the project. Downstream channels (dewatered by diversion construction or receiving additional flow from diversions) are expected to reestablish a dynamic equilibrium for sediment transport and further mitigation of this function is not warranted.
Protection of uplands from erosion or storm damage — This functional value for waters is generally found in shoreline or coastal wetland systems or larger riverine systems. These systems are not present in the project area and this function is not provided by waters of the United States in the project area.

Table 2. Functions Evaluation of Jurisdictional Waters of the United States at the Dos Pobres/San Juan Project
(continued)

Floodwater retention and storage — This functional value is generally associated with headwater wetland systems. These systems are not present in the waters of the United States that would be impacted by the proposed project. Within the region that contains the project area there are several very small wetland systems. These small wetland areas are of a size and are distributed in such a manner that they do not affect, in any measurable fashion, the quantity of water discharging to the Gila River during a storm event capable of generating flows to the river. Xeroriparian habitats adjacent to waters of the United States potentially impacted by the project can influence to some degree the timing of stormwater discharges from the project area. Other than areas of direct impact, xeroriparian habitats are not expected to be significantly altered downstream of the project. This is not a function of waters of the United States impacted by the project.
Groundwater discharge — The DP seep occurs within the footprint of the Dos Pobres mine site. This is the only discharge point that will be directly impacted by the proposed action. As a point of discharge the primary functions provided by this site are the surface water (created by an impoundment of sandbags to water cattle in the bottom of the drainage) and the increased plant biomass and associated habitat values that result from increased availability of water.
Groundwater recharge — The arroyos that are jurisdictional within the project area contribute to recharge of the regional aquifer system during flow events. This mountain front recharge component of the regional hydrologic cycle was considered in the regional groundwater model prepared for this project. The removal of mountain front recharge is reflected in that model's predictions of project impacts to groundwater and surface flows in the Gila River. Mitigation of potential impacts to these resources is being incorporated into the project's HMMP.
Water quality maintenance — This functional value for waters is generally associated with wetland systems where the microbial actions of anaerobic and aerobic bacterial communities associated with these systems provide this function. These systems are not present in the project area and this function is not provided by waters of the United States in the project area.
Historic, cultural, scenic or recreational value — None of the arroyos associated within the project area are 1) part of or are considered eligible for the Wild and Scenic River System; 2) provide unique recreational opportunities; nor 3) provide outstanding scenic values that are disproportionately high when compared to the values provided by adjacent uplands when viewed from nearby communities. This is not a function that requires mitigation or further consideration during permitting evaluation.

Based upon this analysis, mitigation will be required for 68 acres of jurisdictional waters of the United States.

1.4 RESPONSIBLE PARTIES

All phases of mitigation plan implementation and the management of the habitat mitigation bank will ultimately be the responsibility of the Phelps Dodge Mining Company's Arizona Operations Environmental Services Manager.

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2. DOS POBRES/SAN JUAN PROJECT HABITAT MITIGATION AND MONITORING PROGRAM

2.1 HABITAT MITIGATION OBJECTIVES

Mitigation will be provided by a combination of techniques; creation of riparian habitats, enhancement of existing riparian and wetland habitats, and preservation of riparian and lotic habitats. These mitigation objectives will be accomplished at three separate sites within the Safford Valley (Figure 2). To provide the 68 acres of mitigation required to compensate for project impacts to jurisdictional waters of the United States that would result from development of the Proposed Dos Pobres/San Juan Project (the Project), the following mitigation goals and objectives for this project have been established:

- Create 30 acres of riparian habitat,
- Enhance 18 acres of riparian and wetland habitat, and
- Preserve 160 acres of riparian habitats.

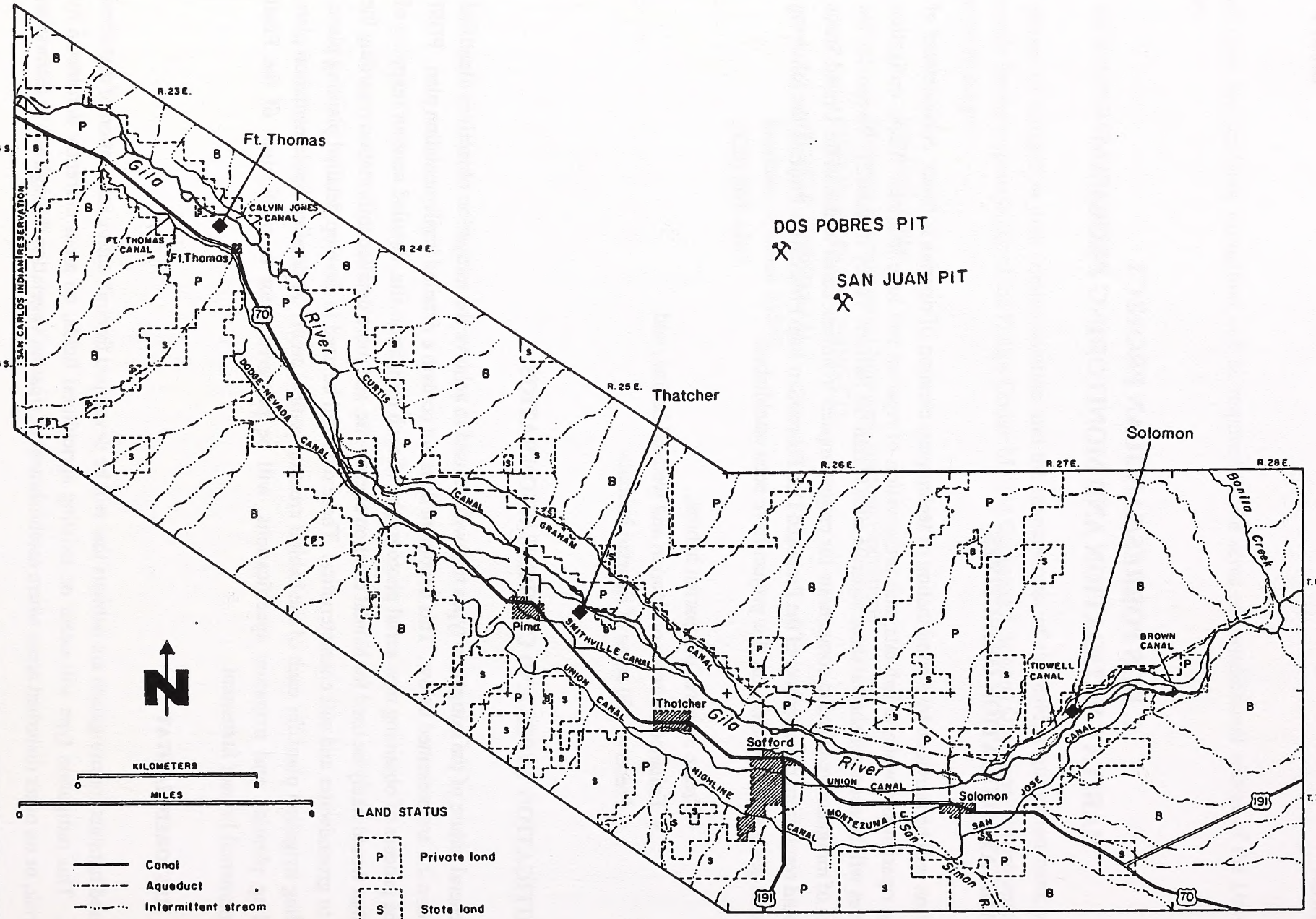
2.2 MITIGATION TYPES AND COMPENSATION RATIOS

The general nature of the mitigation types that will be used to achieve the mitigation objectives identified in Section 2.1 are presented below. This document does not contain a detailed implementation plan. PDSI is in the process of obtaining new aerial photography of each mitigation site, detailed contour mapping of areas that would likely be used for habitat creation at each site, and more detailed information regarding the depth to groundwater and soil characteristics. These data will be used to develop detailed planting plans, including irrigation plans for each of the habitat creation project areas. A detailed implementation plan, including planting and irrigation specifications, will be prepared prior to publication of the Final Environmental Impact Statement.

2.2.1 RESTORED HABITAT

Restored habitats for mitigation are habitats that will be developed through active restoration of disturbed lands. This mitigation type will occur on existing agricultural fields, on areas currently dominated by tamarisk, or on other disturbed areas where establishment of riparian vegetation through active restoration

Tart/CAA/Files/Phelps Dodge/Safford/Land Status Map



WestLand Resources, Inc.

Figure 2

Location Map

Phelps Dodge
Dos Pobres/San Juan
Habitat Mitigation and Monitoring Plan

programs are expected to be successful and to contribute positively to the riverine system. The types of habitat restored at each of the mitigation sites will depend upon site-specific characteristics. Restoration will be accomplished through plantings of native tree and shrub species suitable for the physical characteristics of each site and, as appropriate, seeding with suitable grasses and forbs. Depth to groundwater is expected to be the single biggest factor determining the ultimate nature and distribution of habitats restored for this mitigation effort. Restored habitats will be either willow and/or cottonwood dominated riparian communities or mesquite-dominated riparian habitats. All of these habitats provide significantly greater habitat function than habitats that would be impacted by the Project. The specific nature of the habitat that will be restored at each site will be determined after the depth to groundwater and general soil characteristics has been determined within the mitigation sites.

Because the nature and functions of restored habitats will be greater than those of impacted jurisdictional waters, restored habitats will provide 1:1 compensation for project impacts to jurisdictional waters. This ratio represents the number of acres of restored habitat necessary to offset one acre of impacted waters of the United States.

2.2.2 Enhanced Habitat

Habitat enhancement for mitigation will occur through modification of existing riparian and wetland habitat. The site selected for this effort is an existing wetland/riparian plant community in the early stages of development and is adjacent to known southwest willow flycatcher habitat. The wetland/riparian habitat at the Thatcher mitigation site will be enhanced through vegetation management activities that will limit the density and dominance of tamarisk and other non-native vegetation. This will be accomplished at this site by removal of exotic vegetation (primarily tamarisk) to create and maintain a competitive advantage to native vegetation currently becoming established within this area. Because these areas already have, to some degree, the functions normally attributed to waters of the United States, the compensation ratio is less for this mitigation type than for restored habitats The compensation ratio for habitat enhancement will be 3:1. This ratio represents the number of acres of enhanced habitat necessary to offset one acre of impacted waters of the United States.

2.2.3 Active Management/Preservation

Mitigation through active management and preservation of existing habitats will occur at two of the mitigation sites; Ft. Thomas and the Solomon mitigation areas to protect them from future management/land use activities which would diminish their riparian/wetland functions. Each of these sites contain areas that support existing riparian and lotic habitats. These habitats are within designated Critical Habitat for razorback sucker. During initial spring 1998 surveys, five southwestern willow flycatchers were detected within the areas of the Ft. Thomas site identified for active management and preservation and a nest for common black hawk was detected at the Solomon Mitigation site. All of the preserved habitat areas will provide protected connections between the restored or enhanced habitats and the Gila River riparian corridor, increasing the overall size of the protected habitats along the Gila River. Preservation will be accomplished

by placing an appropriate conservation mechanism (deed restriction, conservation easement, etc.) on all of the lands incorporated into the mitigation plan for the Project. The specific nature of this conservation mechanism will be determined during development of the implementation plan and prior to publication of the Final Environmental Impact Statement.

Preservation of riparian habitats will provide 5:1 compensation for project impacts to jurisdictional waters. This ratio represents the number of acres of preserved habitat necessary to offset one acre of impacted waters of the United States.

2.3 MITIGATION SITES

Three mitigation properties, owned by PDSI and located throughout the Safford Valley, have been identified for use for the Dos Pobres/San Juan HMMP. To facilitate discussion, the sites have been named for nearby towns. Starting at the western end of the valley and working eastward, the properties are: 1) the Ft. Thomas Mitigation Site; 2) the Thatcher Mitigation Site; and 3) the Solomon Mitigation Site (Figure 2). Each of these sites is part of an active farm facility, owned by PDSI and leased to area farmers.

Portions of the three properties that have been identified for mitigation purposes and fenced pursuant to this plan will be set aside by PDSI in perpetuity. In the unlikely event of a transfer of title, the mitigation areas will have an appropriate conservation mechanism in place that limits land use to the mitigation purposes outlined in the Final HMMP. These restrictions will specifically eliminate grazing and pasturage of domestic livestock and construction activities that would require the clearing of vegetation within habitat restoration, enhancement, or active management/preservation areas. A brief discussion of each of these sites, and the nature and types of mitigation that are being considered for each to mitigate for the Dos Pobres/San Juan Project Impacts are presented below.

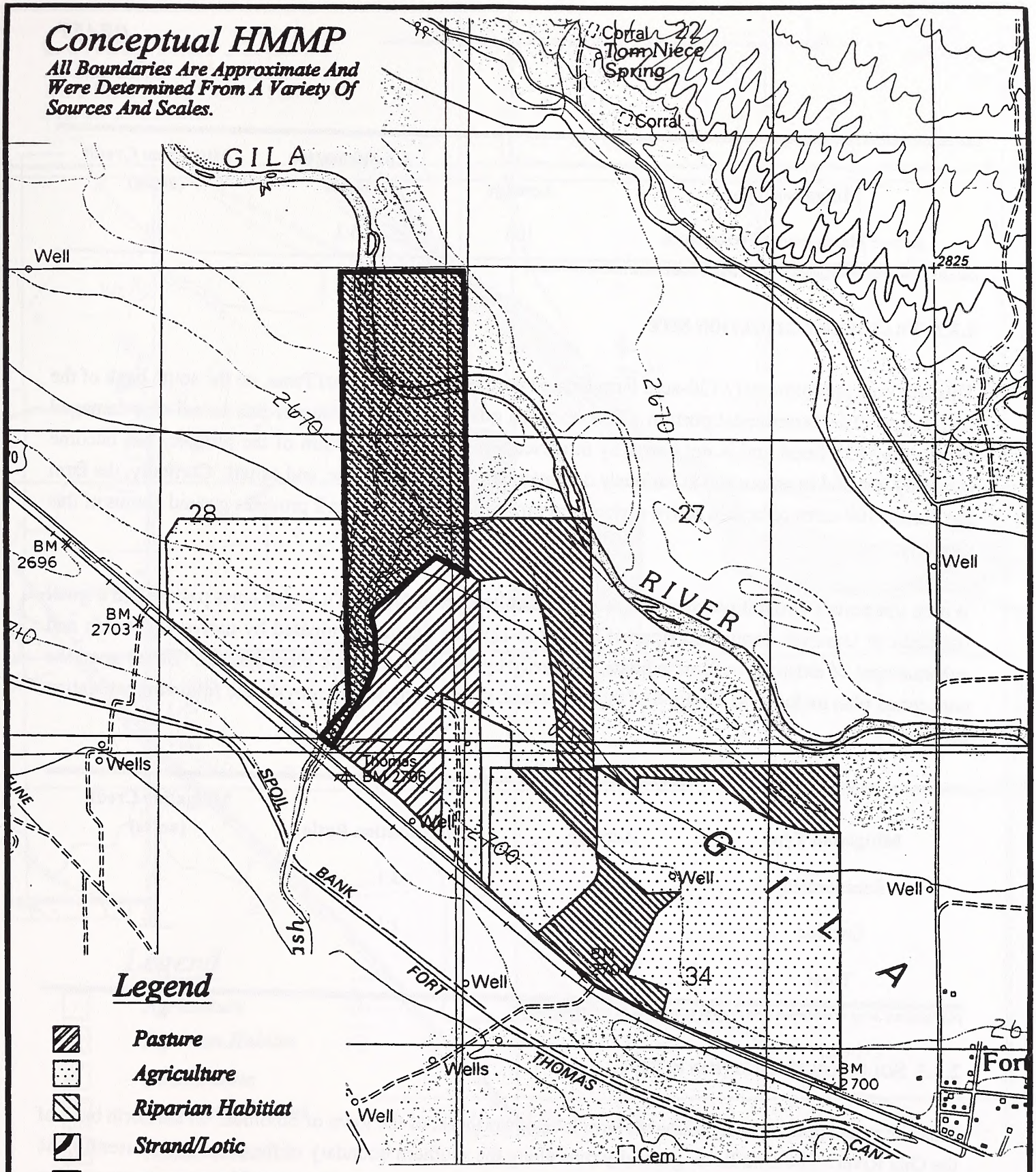
2.3.1 FT. THOMAS MITIGATION SITE

This site is a 545-acre farm located northwest of the town of Ft. Thomas, on the south bank of the Gila River. The river runs through the northernmost quarter-quarter section of the property. Currently, the farm has approximately 295 acres of active agricultural fields and 64 acres of cleared pasture. Photo-sheet 1 provides ground-photos of the property.

Within this parcel, three mitigation strategies are viable: restoration of tamarisk-dominated riparian habitat to riparian habitats dominated by native vegetation; conversion of a cleared pasture area to a mesquite-dominated riparian community; and active management/preservation of existing riparian habitats, including a portion of the Gila River corridor. For the Dos Pobres/San Juan Project, 100 acres of riparian habitat, including the Gila River where it crosses through the mitigation site will be set aside and preserved in place. Based upon the conceptual plan included as Figure 3 of this document, the property would provide the following mitigation acreage and credits.

Conceptual HMMP

All Boundaries Are Approximate And Were Determined From A Variety Of Sources And Scales.



Legend

- Pasture
- Agriculture
- Riparian Habitiat
- Strand/Lotic
- Preserved Habitat
- Dos Pobres/San Juan Mitigation Boundary

N

0' 750' 1500' 2250'

WestLand Resources Inc.
Engineering and Environmental Consultants
2343 E. Broadway Blvd. Suite 202
Tucson, Az 85719 (520) 206-9585

Dos Pobres/San Juan Project
Habitat Mitigation and Monitoring Plan
Ft. Thomas Mitigation Site

Phelps Dodge Safford, Inc.

DESIGNED BY: TM	DRAWN BY: GGF	CHECKED BY: JAT	FIGURE
DATE APRIL 14, 1998	PROJECT NO. 0201-02-835	SCALE:	3
WESTLAND RESOURCES DRAWING PATH WESTLAND\PROJECTS\07202-1\PD-GVID\ALDER-BAMLDNG			

Mitigation Type	Acreage	Compensation Ratio	Mitigation Credit (acres)
Active Management/Preservation	100	5:1	20

(All ratios are acres of mitigation area to acres of impacted jurisdictional waters)

2.3.2 THATCHER MITIGATION SITE

This site is an approximately 120-acre farm located northeast of the town of Pima, on the south bank of the Gila River. The easternmost portion of the northern quarter-quarter section of this parcel was damaged during the 1993 flood and is not currently in agricultural use. This portion of the property has become primarily wetland in nature and is variously dominated by tamarisk, willow, and cattail. Currently, the farm has almost 100 acres of land in active agricultural production. Photo-sheet 2 provides ground photos of this property.

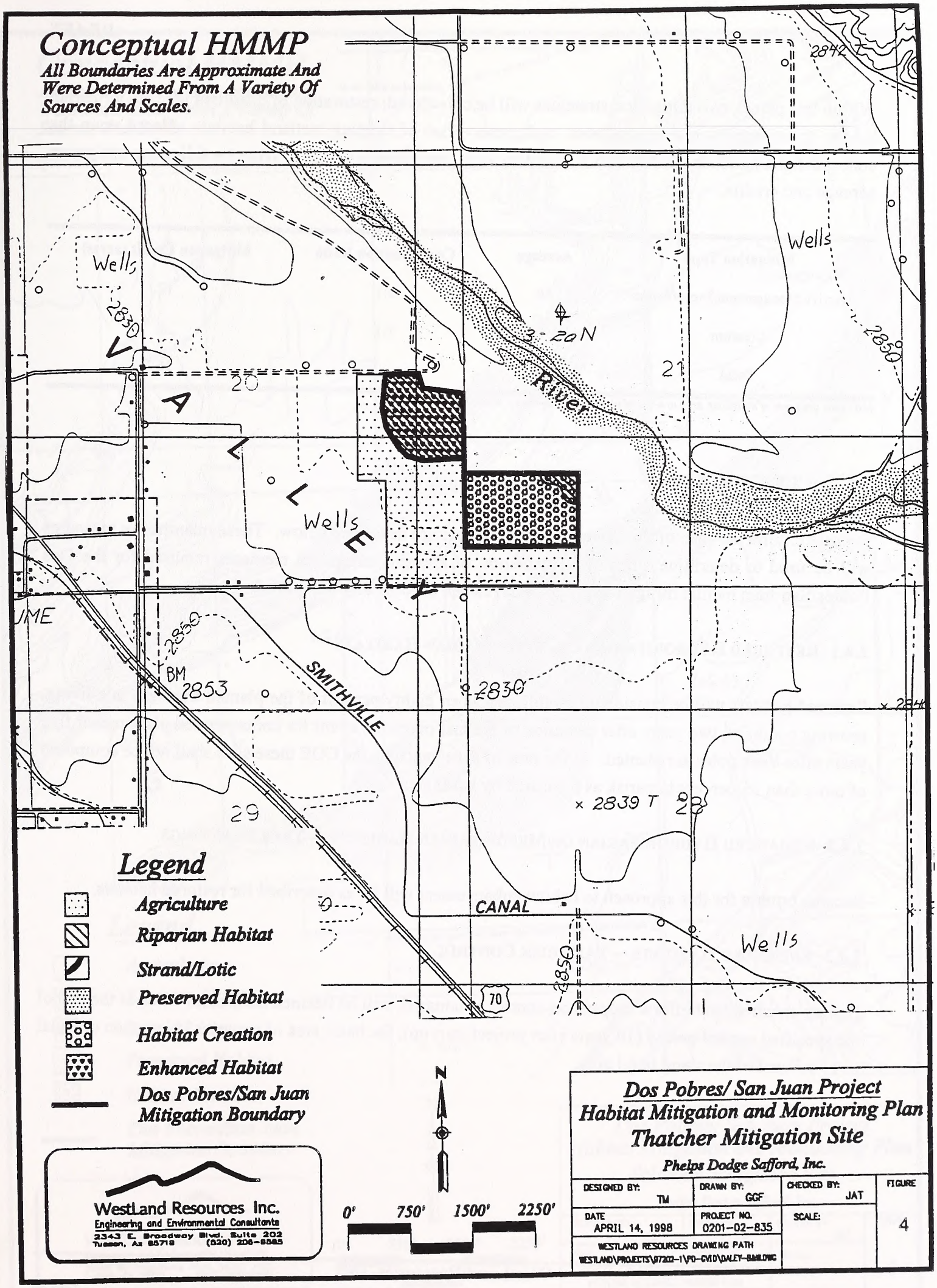
Within this parcel, two mitigation strategies will be utilized: restoration of a Sudan grass pasture and a small fragment of tamarisk dominated riparian habitat to riparian habitat dominated by native vegetation and enhancement of existing wetland habitats, primarily by removal of exotic plant species. Based upon the conceptual plan included as Figure 4 of this document, the property would provide the following mitigation acreage.

Mitigation Type	Acreage	Compensation Ratio	Mitigation Credit (acres)
Enhancement	18	3:1	6
Creation	26	1:1	26
Total	**44**		**32**

(All ratios are acres of mitigation area to acres of impacted jurisdictional waters)

2.3.3 SOLOMON MITIGATION SITE

This site is an approximately 223-acre farm located northeast of the town of Solomon, on the north bank of the Gila River. The Gila River generally runs along the southern boundary of the property. Currently, the farm has approximately 175 acres of active agriculture. Approximately 60 acres of the property are riparian or lotic habitat. Photo-sheet 3 provides ground-photos of proposed mitigation areas.


Conceptual HMMP
All Boundaries Are Approximate And Were Determined From A Variety Of Sources And Scales.
Wells
2830
VALLEY
20
21
River
3-20N
2842 T
2850
Wells
Wells
UME
2850
BM
2853
SMITHVILLE
2830
29
× 2839 T
28
CANAL
Wells
2850
70
Legend
Agriculture
Riparian Habitat
Strand/Lotic
Preserved Habitat
Habitat Creation
Enhanced Habitat
Dos Pobres/San Juan Mitigation Boundary
N
0'
750'
1500'
2250'
WestLand Resources Inc.
Engineering and Environmental Consultants
2343 E. Broadway Blvd. Suite 202
Tucson, Az 85719 (520) 206-9585
Dos Pobres/ San Juan Project
Habitat Mitigation and Monitoring Plan
Thatcher Mitigation Site
Phelps Dodge Safford, Inc.
DESIGNED BY: TM
DRAWN BY: GGF
CHECKED BY: JAT
FIGURE 4
DATE APRIL 14, 1998
PROJECT NO. 0201-02-835
SCALE:
WESTLAND RESOURCES DRAWING PATH
WESTLAND\PROJECTS\97202-1\PD-GVID\DALEY-B&WLDWG

Within this parcel, two mitigation strategies will be considered: restoration of disturbed lands to a riparian habitat dominated by native vegetation and preservation of existing wetland habitats. Based upon the conceptual plan included as Figure 5 of this document, the property would provide the following mitigation acreage and credits.

Mitigation Type	Acreage	Compensation Ratio	Mitigation Credit (acres)
Active Management/Preservation	60	5:1	12
Creation	4	1:1	4
Total	**64**		**16**

(All ratios are acres of mitigation area to acres of impacted jurisdictional waters)

2.4 SUCCESS CRITERIA

Success criteria for each of the habitat mitigation types are described below. These quantitative measures will be used to determine when implementation of specific mitigation elements required for the Dos Pobres/San Juan habitat mitigation program have been successfully completed.

2.4.1 RESTORED HYDRORIPARIAN OR MESORIPARIAN HABITATS

Restored habitats will be considered established when eighty percent of the planted trees are in a living, growing condition two years after cessation of the last irrigation event for containerized plantings or five years after York poles are planted. At the time of acceptance by the COE these sites shall not be composed of more than 15 percent tamarisk as measured by basal area

2.4.2 ENHANCED HYDRORIPARIAN OR MESORIPARIAN HABITATS — TREE PLANTINGS

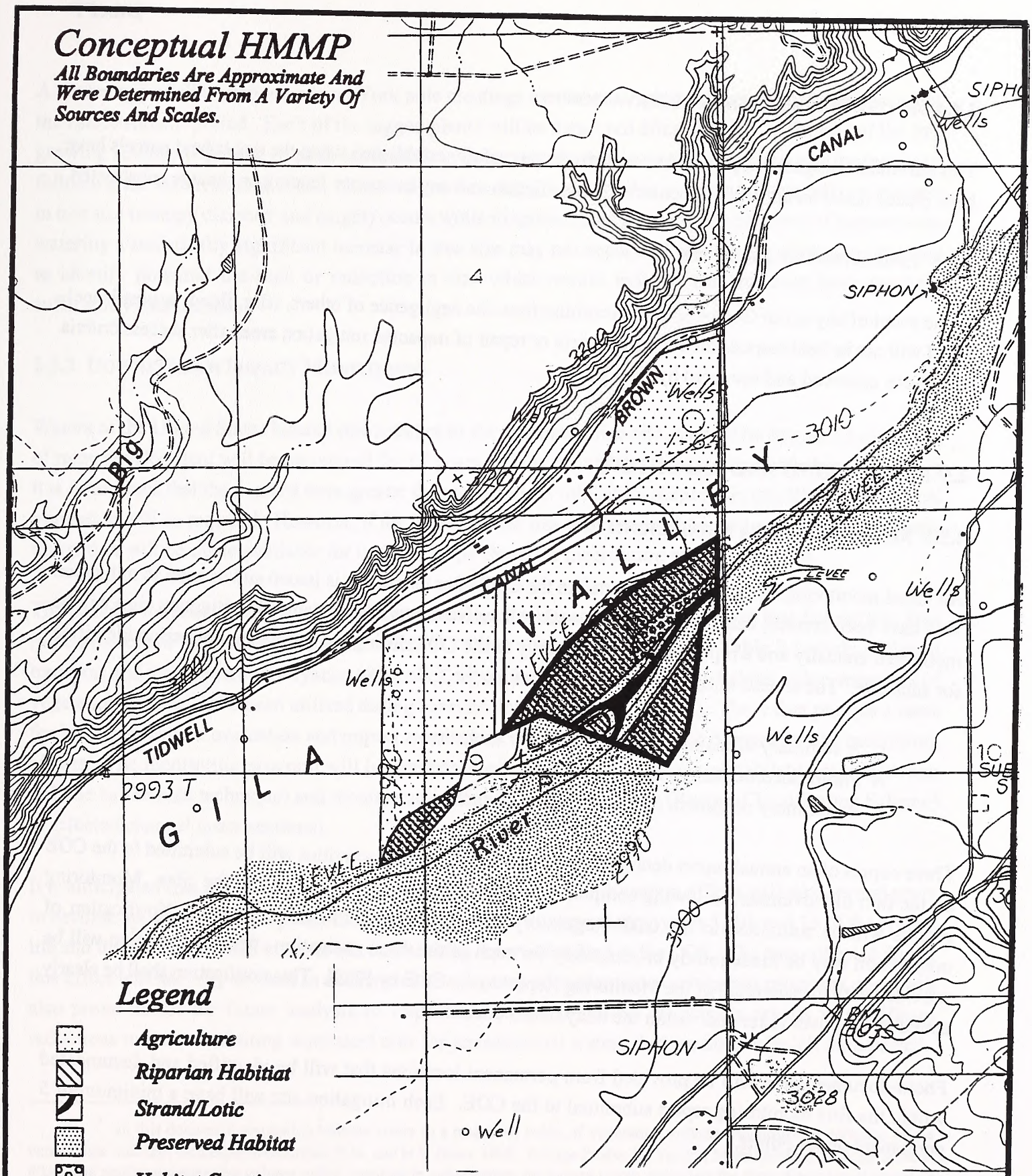
Success criteria for this approach to habitat enhancement will be as described for restored habitats.

2.4.3 ENHANCED HABITATS — TAMARISK CONTROL

Habitat enhancement efforts focused on control of tamarisk will be deemed successful when at the end of the specified control period (10 years after project start up), the basal area of tamarisk is less than or equal to 15 percent of the stand basal area.

Conceptual HMMP

All Boundaries Are Approximate And Were Determined From A Variety Of Sources And Scales.



Legend

- Agriculture
- Riparian Habitiat
- Strand/Lotic
- Preserved Habitat
- Habitat Creation
- Dos Pobres/San Juan Mitigation Boundary

N

0' 750' 1500' 2250'

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2343 E. Broadway Blvd. Suite 202
Tucson, Az 85719 (520) 206-9585

Dos Pobres/ San Juan Project
Habitat Mitigation and Monitoring Plan
Solomon Mitigation Site

Phelps Dodge Safford, Inc.

DESIGNED BY: TM	DRAWN BY: GGF	CHECKED BY: JAT	FIGURE
DATE APRIL 14, 1998	PROJECT NO. 0201-02-835	SCALE:	5
WESTLAND RESOURCES DRAWING PATH WESTLAND\PROJECTS\07202-1\PD-GVID\DALE-BUILDING			

2.4.4 ACTIVE MANAGEMENT/PRESERVATION

This particular mitigation type will be considered successfully established when the target land parcels have been placed under an appropriate conservation restriction and any necessary fencing or signage constructed.

2.4.5 LIMITATION OF LIABILITY

In the event of any act of God or an event resulting from the negligence of others, (fire, flood, or pestilence), PDSI will not be held responsible for replacement or repair of impacted mitigation areas after success criteria have been achieved and accepted by the COE.

2.5 MONITORING AND REPORTING

2.5.1 MITIGATION AREA MONITORING

An initial monitoring report will be submitted to the COE after the permit is issued and as soon as mitigation sites have been created, enhanced, and preserved. All active (restored or enhanced) mitigation sites will be monitored annually and a report submitted annually to the COE during the establishment period identified for each site. The annual mitigation report will include the following:

1. A summary of maintenance activities for each site,
2. Photo-documentation, and
3. A summary of growth data collected from each site .

Three copies of an annual report detailing the results of monitoring activities will be submitted to the COE on the first of November, following completion of all mitigation activities at all of the sites. Monitoring reports will be submitted to the COE Regulatory Branch office in Phoenix, Arizona. Notification of completion may be made jointly or separately for each of the three mitigation sites. Notification will be provided with the submittal of the Monitoring Report to the COE by PDSI. This notification shall be clearly stated in the cover letter and within the body of the document.

Photo-documentation will be provided from permanent locations that will be identified and documented within the first monitoring report submitted to the COE. Each mitigation site will have a minimum of 5 permanent photo-points.

Within restored and enhanced habitat areas that use supplemental irrigation during the establishment period, detailed records of the timing and duration of irrigation events will be maintained and summarized for mitigation monitoring reports.

A percentage of all containerized and York pole plantings used at each mitigation site will be tracked during the establishment period. Each of the tagged plants will be measured after planting, at the end of the first growing season, at the end of each subsequent growing season that irrigation is applied and for two years following the last irrigation event. Trees will be monitored to insure that a statistically significant increase in tree size (canopy diameter and height) occurs while irrigation takes place. Upon cessation of supplemental watering a statistically significant increase in tree size may not occur and monitoring efforts are intended to identify potential die-back or reduction in size which would indicate that the trees have not been sufficiently established.

2.5.2 Downstream Impact Monitoring

Waters of the United States located downstream of the proposed mine site that will be dewatered as a result of mine development will be monitored for 15 years to determine if the mitigation provided is adequate. If it is determined that the impacts were greater than assumed for mitigation purposes in this HMMP, additional mitigation will be required. However, if the impacts were less than assumed for mitigation purposes excess mitigation will be made available for use by Phelps Dodge to meet future mitigation needs.

The primary function (Table 2) of the jurisdictional waters impacted by the proposed Dos Pobres/San Juan mine project are their habitat value for wildlife. Other functions identified in Table 2 include sediment transport and stormwater conveyance. To provide specific measures of riparian habitat value, measures of vegetation volume[3] have been utilized during baseline data collection (Table 1). These data provide a basis for long term habitat evaluation and impact assessment[4] and will be repeated in comprehensive monitoring efforts. The monitoring program will be composed of 1) structural measures of habitat (total vegetation volume by the pole technique) and monitoring of channel geomorphology (Rosgen Classification Scheme) at selected channel cross sections).

It is anticipated that the effects, if any, associated with stormwater diversion efforts will take several years to become apparent. The proposed monitoring program will occur during years 5, 10, and 15 of the project life and the results included in the Project monitoring report submitted to the COE. The data collected during this effort will not only be used to determine the adequacy of implemented mitigation programs, they will also prove useful for future analysis of impacts when the proposed fill activity results in significant reductions in the contributing watershed area for jurisdictional waters that are otherwise left unimpacted.

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[3] In this document vegetation volume refers to a measured index of vegetation volume that utilizes a variation of the vertical line intercept technique (MacArthur, R.H. and H.S. Horn. 1969. Foliage Profile by Vertical Measurements. Ecology 50:802-804). The resulting vegetation volume index, reported in cubic meters per square meter, considers the three dimensional nature of a plant community and has been shown to strongly correlate with breeding-bird densities.

[4] Because it is impractical to measure all of the wildlife species associated with a given habitat type, indirect measures of wildlife value utilizing habitat parameters are typically used to quantify or estimate habitat value. In the arid southwest higher volumes of vegetation are typically associated with increases in available moisture and thus normally are found to correlate strongly with productivity.

2.6 CONTINGENCY MEASURES

Success or failure to achieve the mitigation objectives identified for the mitigation sites will be identified in the five year and subsequent year monitoring reports submitted to the COE. In this report PDSI will identify the degree of success achieved, the likely causes for any failure, and, if necessary, the proposed measures that will be implemented to achieve project success. Should implementation of contingency measures become necessary, PDSI will schedule a meeting date with the Corps to establish a schedule for development and implementation of contingency measures.

Correction of the foreseeable causes for not achieving the success criteria outlined in previous sections are not likely to require utilization of alternative mitigation locations. Should any problems arise that require implementation of contingency measures on other than the proposed mitigation sites PDSI will coordinate with the COE who will, in turn, contact resource agencies.

3. WATER RESOURCES MITIGATION

3.1 INTRODUCTION

3.1.1 REGULATORY BASIS FOR WATER RESOURCES MITIGATION

This section of the Draft HMMP summarizes mitigation proposed to off-set the effects of anticipated project impacts to water resources. The potential impacts that result from water use required for project development and the effects of development of the Dos Pobres and San Juan mine pits on water resources in the vicinity of the proposed mine project were identified as scoping issues during public scoping efforts for the Dos Pobres/San Juan Project Environmental Impact Statement. This aspect of the HMMP stems specifically from the scoping and mitigation requirements that arose from implementation of the NEPA process.

3.1.2 AN OVERVIEW OF THE WATER RESOURCES MITIGATION PROGRAM

Water resources mitigation provided in this Draft HMMP is presented as two distinct but interrelated elements. The first is the Groundwater Model, Monitor, and Mitigate Program developed by the ID team. This program will be used to validate model results through time and, if necessary, determine if additional water mitigation is required. The second element of the mitigation program is a fallow lands agricultural management strategy that will leave surface water in the Gila River to protect aquatic and riparian resources and off-set any predicted impacts to the stream from pumping at the project site. Each of these elements of the water resources mitigation program are discussed in greater detail below.

3.2 IMPACTS AND MITIGATION REQUIREMENTS

3.2.1 GROUNDWATER & SURFACE WATER IMPACTS

In conjunction with BLM hydrologists, Dames & Moore (1997a, 1997b, 1997c, 1997d, 1996) prepared a groundwater model to evaluate the potential impact of the proposed Dos Pobres/San Juan Project (the Project) on the groundwater and surface water regimes near Safford. The purpose of the model was to predict what impact, if any, there may be on water resources from development of the proposed open pit mines and groundwater production wells. Of particular interest was the potential impact to surface flows in the Gila River, approximately eight miles south of the proposed production well field.

Except in the immediate vicinity of the mine, and to the southwest of the Gila River channel, hydrologic information on aquifer parameters, and the hydrologic effects of faults are essentially non-existent. As a result, calibration of the model was accomplished by trial and error adjustment of aquifer parameters within the limits of values reported in the literature for these and/or similar units. In addition, the boundary fluxes in the model were also constrained by either data from USGS streamflow gages, or published estimates of subsurface flows both into and out of the model domain. While the model calibration resulted in acceptable matches of computed and observed water levels in wells, the present model is but one of many unique solutions that might match computed and observed values with equal precision. As the volume of water extracted by the mining operation increases, the aquifers in the vicinity of the mine will be stressed, and changes in the water levels in monitoring wells, when compared to model predictions, will provide a means of better defining parameters of the aquifers, as well as the hydrologic effects of any faults.

Impacts to surface flows in the Gila River as a result of groundwater pumping are expected to be extremely small relative to their average annual flows. This is attributed to the relatively short duration (16 years) of pumping and the amount of water being pumped (peak rate of approximately 5,000 gpm) versus the amount of water flowing through the regional groundwater system. The maximum predicted impact to the Gila River from impacts to groundwater flow over the life of the project (16 years) will be approximately 4.5 af/yr (Dames & Moore 1997e). These modeled impacts are projected to increase steadily from the end of mining, reaching 26 af/yr in about 100 years, and then reaching about 35 af/yr by year 300. The maximum impact of 35.4 af/yr is projected to occur 416 years after initiation of mine development. Impacts continue at levels exceeding 35 af/yr through the 500-year period of the model projection.

It is estimated that the project will cause a reduction in average annual runoff of non-incidental surface water flows of approximately 40 acre-feet. The change in runoff was estimated as the difference in runoff between: 1) the baseline watershed conditions, which excludes the runoff reduction caused by capture of incidental sheet flow by proposed mine facilities, and 2) the overall runoff reduction under post-project watershed conditions.

Finally, the model projection of the mine operations showed no impact on Bonita Creek and it predicted drawdown of over 35 feet at the closest point of the San Carlos Apache Reservation. Monitoring will be conducted in wells between the mine and reservation to assess the accuracy of model predictions (see Group 4 wells, Table 3).

Table 3. Wells to be Measured at Periodic Intervals

Well Group	Well I.D.	Model Location X	Model Location Y	Layer(s)	Surface Altitude	Open Interval	W.L. Elevation	Date Measured
	AP-11	60647	43121	10	3680	2891-2841	3094	06/19/96
	AP-12	62519	45878	8	3798	3239-3189	3253	06/16/96
	AP-20	72037	48614	9	4041	3114-3054	3531	07/23/96
	AP-22	66600	42180	9 & 10	3669	3017-2917	3038	06/17/96
	AP-23	71951	44313	9	3757	3001-2951	3033	06/18/96
	AP-24	74312	45580	8 & 9	3835	3195-3095	3219	06/17/96
Group 2	AP-26	70360	40650	9	3645	3026-2976	3031	06/17/96
	AP-27	66387	35415	9 & 10	3414	2985-2935	3039	06/18/96
Measured	AP-28	70609	36364	9 & 10	3474	2965-2915	3030	06/18/96
Quarterly	AP-29	74321	38998	9 & 10	3501	2984-2934	3031	06/19/96
	AP-30	77796	45854	6	3501	3575-3525	3677	06/--/96
	AP-34	63356	37968	13	3487	2337-2287	3027	?
	DPW-1	56460	43792	8 & 9	3697	3135-3085	3200	06/26/96
	DPW-3	69125	43894	9 & 10	3839	3037-2927	3039	06/--/96
	DPW-7	58813	39013	10 & 11	3508	2830-2780	3031	?
	DPW-8	59567	30060	10	3217	2909-2874	3025	06/26/96
	DPW-10	48079	31355	11	3247	2710-2680	3024	06/26/96
	DPW-11	52870	32020	10	3273	2930-2900	3022	06/26/96
	DPW-12	50780	26749	12 & 13	3094	2484-2444	3019	06/26/96
	DPW-13	55509	27549	11 & 12	3144	2633-2603	3020	06/26/96
	DPW-15	67202	39424	10 & 11	3572	2807-2777	3033	06/--/96
	DPW-16	63356	37968	11	3490	2720-2690	3031	06/26/96
	AP-1	59374	53301	5 & 6	4166	3669-3558	3754	06/16/96
	AP-2	62128	53303	4	4166	3887-3837	4093	06/16/96
	AP-3A	66362	56934	4	4493	3913-3863	3892	06/--/96
Group 3	AP-9	68253	54253	3	4370	4238-4188	4182	06/18/96
	AP-10	71959	53811	7	3930	3441-3391	3930	06/16/96
Measured	AP-21	75084	49664	4	4087	3830-3780	3838	06/18/96
Annually	AP-25	74001	47666	5	3917	3663-3603	3899	06/17/96
	AP-32	67565	52852	5	4183	3777-3727	3898	06/16/96
	DPW-5	64225	54722	9 & 10	4292	2967-2917	3962	06/--/96
	DPW-6	70309	53092	6 & 7	4160	3459-3409	4079	06/--/96
	Gl-T18	50521	51852	9 thru 15	4210	2974-2596, 2486-1709	3309	08/27/97
Group 4	Gl-T20	51631	54466	4 thru 10	4300	3808-3208 3128-2828	3823	08/27/97
Measured	Gl-T25	55185	53731	3 thru 9	4335	4135-3015	4109	10/09/97
Annually	Gl-T34	50199	47410	7 thru 14	3924	3297-1435	3257	11/05/97
	Gl-T38	45824	54231	4 thru 14	4372	3873-2454, 2160-2017	3831	11/16/97

3.2.2 SPRINGS, SEEPS, AND WATSON WASH FLOWING WELL

The groundwater model predicts a possible 0.47-foot reduction in wellhead pressure at the Watson Wash Flowing Well located southwest of the project area by year 126 of the model run (Dames & Moore 1997e). The impact decreases after this peak as the regional aquifer system recovers. Springs in the vicinity of the project area are not expected to be impacted by the proposed development. The Butte Fault appears to isolate these springs from the Graben where groundwater will be pumped for mining purposes (R. Mac Nish, pers. comm. with J. Tress, April 1998).

3.2.3 WATER RESOURCES MITIGATION REQUIREMENT SUMMARY

The predicted annual impact to the Gila River that may result from development of the proposed mine peaks at approximately 75.4 acre-feet annually after year 400. This estimate includes impacts from groundwater pumping, the cone of depression created by the mine pit development, and reduction in ephemeral tributary flows that result from development of surface water management systems within the mine facility. Mitigation efforts will begin during year one of the project and will be based upon the maximum annual predicted impact.

3.3 MITIGATION APPROACH

3.3.1 GROUNDWATER MODEL, MONITOR & MITIGATE PROGRAM

3.3.1.1 Strategy and Approach. The most permeable aquifer between the mine and the Gila River is the Lower Basin Fill (Dames & Moore, 1997e). If the model's present configuration either over-represents or under-represents flow moving from the mine area toward the river, the signal (a growing disparity between model projected and measured water levels in wells) will be most apparent in this aquifer. Layer 9 (and alternately, layer 10) of the model has a sufficiently extensive area comprised of Lower Basin Fill in a broad northwestward trending swath between the mine and the Gila River to satisfy the monitoring objectives. The monitoring wells located within this portion of the aquifer (Table 4 - Group 1 wells) will be used to evaluate the accuracy of the modeled impact assessment. If the changes in water levels in these wells varies significantly from predicted changes, model calibration will be adjusted to bring the projected levels and gradients within those bounds. After recalibration, the mining impact projection would be rerun to determine if any modification of the implemented mitigation measures is necessary.

Table 4: Group 1 (Lower Basin Fill) Monitoring Network

MONITORING WELL NETWORK FOR SAFFORD PROJECT MODEL

WELL	UTM COORD[5]		MODEL CELL		ALSD[4]	DEPTH[4]	SCREENED INT.		MODEL LAYER[2]		WATER LEVEL[4]		MONITORING
Identifier	X	Y	X	Y			Top	Bottom	Unit	#	Measured	Modeled	FREQUENCY
LBF - 1	619198.39	3643389.6	87	42	3255	302	3053	2953	LBF	9	3019	3019+	Daily[3]
LBF - 2	619630.69	3644066	85	42	3349	396	3053	2953	LBF	9	3024	3024	Daily
LBF - 3	621513.08	3641910.3	87	74	3290	337	3053	2953	LBF	9	3030	3030	Daily
LBF - 4	621945.38	3642586.8	85	74	3385	432	3053	2953	LBF	9	3035e	3035	Daily
LBF - 5[1]	617605.66	3644790.9	87	20	3255	302	3053	2953	LBF	9	3025e	3025	Daily
LBF - 6[1]	617437.96	3645467.3	85	20	3362	409	3053	2953	LBF	9	3030e	3030	Daily
LBF - 7[1]	623310.91	3640761.4	87	89	3260	307	3053	2953	LBF	9	3020	3020	Daily
LBF - 8[1]	623743.2	3641437.8	85	89	3335	382	3053	2953	LBF	9	3025	3025	Daily

[1] Wells drilled only if a clay layer is encountered which exceeds 30% of the saturated thickness of model layer 9 in LBF - 1 thru 4.

[2] If wells are finished in layer 10, they will be 164' deeper, and the screened interval will be from 2,952 to 2,788 elevation.

[3] Daily during pre-mining calibration and quarterly after mining begins.

[4] Elevations of land surface, and water levels and the depths of wells are estimated from topographic and/or model generated contour maps.

[5] UTM Coordinates are the exact centers of model calls. Conditions encountered in drilling may result in some dislocation from model call centers.

ALSD = Altitude of Land Surface Datum

"e" = estimated.

3.3.1.2 Monitoring Well Construction. A minimum of four monitoring wells (two pairs) will be constructed using the methods outlined in this section. These wells (the Group 1 wells) are listed in Table 3. Because the water levels computed by the model represent the average value of the entire model cell, it is best to locate any monitoring well as near the center of a model cell as possible, particularly if the model cell is large in either or both horizontal dimensions. If two wells are constructed approximately along a flow line of the aquifer, disparities in changes between computed and observed gradients can be easily determined. For the purposes of this project, spacing between the paired wells along the flow line should be greater than 1,500 feet, and probably less than 3,500 feet. Two pairs of wells constructed near the center of model cells, with each pair approximately along a flow line in the Lower Basin Fill aquifer, and with each well open to the entire saturated thickness of a single model layer will provide a sufficient monitoring network.

It is preferred that each well pair be completed in layer 9. However, if a thick clay layer is encountered in layer 9, in excess of 30 percent of the saturated thickness of the layer, the well pair will be completed in layer 10 and an additional well pair constructed. The number of constructed (Group 1) well pairs will not exceed four. The recommended locations of the wells are at or near the cell centers of model cells in rows 85 and 87, columns 42 and 74. If a thick clay layer, as defined above, is encountered in either column 42 or 74 well pairs, then additional well pairs will be required in column 20 and 89, respectively. The wells in row 87, LBF-1 and LBF-3, (and LBF-5 and LBF-7, if necessary) should be drilled before the wells in row 85 because the wells in row 87 are the most likely to encounter clay.

Column 42 lies about 1,000 feet west of Watson Wash and column 74 lies about 500 feet east of Cottonwood Wash. Column 20 of the model lies about 4,000 feet west of Coyote Wash, and column 89 is 1,000 feet east of Peterson Wash. Row 87 of the model is approximately halfway between the traces of the Southwest and Valley Edge faults, and row 85 is about 2,600 feet to the northeast. The flow lines in the aquifer roughly parallel the columns of the model, so in each of the four columns, the difference in the water levels in each pair of wells in rows 85 and 87 would approximate the gradients along the four flow lines. Recommended locations and specifications as to depth and top and bottom elevations of screened intervals are shown in Table 3. Elevations of land surface and model projected water levels shown in Table 3 are estimated from contour maps. As a result, the estimated total depth of the wells shown in Table 3 will be in error by the same amount though opposite sign, as the land surface.

The casing/screen diameters and materials are not critical, as long as they are sufficient to permit development of the well to assure good connection with the aquifer after construction. Because the Lower Basin Fill is expected to be unconfined in this area, no special packing and sealing (other than a good surface seal) is necessary.

3.3.1.3 Pre-Mining Monitoring Well Calibration. New monitor well pairs completed in the same layer (the Group 1 wells) will be equipped with instrumentation capable of recording water level data on daily intervals. This instrumentation should be operated for one, and preferably two years to obtain background information on annual fluctuations in the area. Each well should be visited monthly to check the water level

by sounding with a steel tape or electric sounder. This will ensure the equipment is operating properly and that data from instrumentation in the well is captured. This monthly round of data collection during the pre-mining period may include measurements at additional wells in the area and in wells between the Butte and Valley faults.

If average water levels in the monitored Group 1 well pairs (after recovery from drilling and well development) differ by more than 30 feet[5] from the corresponding average projected steady-state model water levels, or the gradients between wells along any flow line differs by more than 25 percent from the model's steady-state simulation, the model calibration should be adjusted to bring the projected levels and gradients within those bounds. If such recalibration is necessary, then the mining impact projection should be re-run to determine whether any modification to the mitigation measures is needed.

3.3.1.4 Data Acquisition. Tables 3 and 4 list wells in the mine area whose water levels should be measured on a periodic basis after mining begins. The basis of the well selection for Group 2 and 3 is that the well construction is known, and the well is open to a relatively small vertical section, ideally within one model layer. Group 3 wells were split from Group 2 wells because they are not required for evaluating whether or not to recalibrate the model, though data from these wells will be useful in any required recalibration effort. Except for the wells used to monitor conditions between the mine and the San Carlos Apache Reservation (Group 4 wells), no wells are included that are open to more than two model layers. To provide the best information with which to perform any necessary model recalibration, the water level measurement schedule should be quarterly for Groups 1 and 2 wells and annually for Groups 3 and 4 wells after mining begins. While large discrepancies between observed and model projected heads may indicate poor model calibration, such discrepancies in the graben area need not trigger model recalibration, because the complex faulting in this area made it difficult to obtain a good match between observed and computed water levels for the simulation of the pumping tests conducted in 1996.

3.3.1.5 Data Analysis. Annually, water level data from each LBF monitoring well should be averaged for each month and the drawdown computed from the last monthly average water level for that well and the water level in that well at the time of the most recent model calibration. The observed drawdown is then compared with the modeled drawdown over the same period of time. Figure 7 illustrates the groundwater model and monitor process.

All evaluations are made annually, and the period of each analysis is from the date of the most recent model calibration to the current date. These evaluations are made with the actual pumping stress over that period of time entered in the model, accompanied by any changes in plans for pumping in subsequent years. The model results will then reflect the effects of actual pumpage up to the current year, as well as out-year projections that may affect mitigation measures.

[5] The mean error for model-projected water levels in wells in this vicinity.

Exhibit 1 describes the procedural details for computing the values used in Figure 6. The values shown on Figure 6 that are used as recalibration triggers in the Groundwater Model, Monitor, and Mitigate Program have the potential to trigger periodic recalibration efforts if substantial changes in the model are required after mine pumping reveals more information on the hydrologic conditions at the site. For this reason, unless changes identified in Figure 6 are more than double those shown, model recalibration should not be made until three years of mining operation have elapsed since the most recent model calibration. This will allow the acquisition of sufficient data to recalibrate the model to the point that frequent recalibration may not be required over the life of the mine operation.

3.3.1.6 Expectations. Because the boundary fluxes in the present model are thought to be in reasonable ranges, any recalibration required because of disparities between predicted and observed response should be relatively simple. In addition, we can infer that the total cumulative impact on the Gila River will be about the same as that projected by the current version of the model. If recalibration is necessary, the most probable result bearing on mitigation measures will be the distribution of mining impacts over time. If recalibration becomes necessary, most of the changes are likely to be in the immediate vicinity of the mine, and the water level data collected in the monitoring program for Groups 1 through 4 wells will facilitate any necessary recalibration.

To put bounds on the expectations of the amount and timing of monitoring and recalibration efforts, we can conjecture that the connection between the mining area and the river might be substantially better than the present model simulates (i.e., the Valley fault is more permeable). If this is indeed the case, the first recalibration might occur in the third or fourth year after the beginning of mining. Because the effects of the mine pumping, even with a higher permeability Valley Fault, will take a year or so to reach the monitoring well network, and even longer to reach the Gila River, the number of recalibrations may be as little as two, or as many as three over the life of the mining operation with the last recalibration at or shortly after the end of mine pumping. With the models' capability of predicting mitigable changes in flow to the Gila River long in advance of the time mitigation must be implemented, there is no need for recalibration at intervals of less than three years. After the mine operation is completed, further recalibration is unlikely, and monitoring activity can be limited to an annual round of manual measurements for three to five years, and extended to three year intervals thereafter, until satisfied the model is reasonably predicting conditions as the system again approaches steady state.

At the opposite end of the spectrum, if the present model is an accurate representation of the hydrologic system, recalibration would not be required, and monitoring for tracking the model would be unnecessary after the end of mining.

EXHIBIT 1

EVALUATION OF GROUNDWATER LEVEL DATA FOR COMPARISON TO GROUNDWATER MODEL PREDICTIONS

Introduction:

This document describes the specific steps to follow in processing the water level data obtained from wells in the vicinity of the Dos Pobres/San Juan Mine area before and during mining operations. In this document, underlined items are used in the calculation of critical values used in the decision process outlined in Figure 6 of this report. The critical values used in Figure 6 are shown in bold-face type.

Pre-mining Monitoring Program:

Prior to the onset of mining operations, and before any significant pumping begins in the vicinity of the mine, the Group 1 (LBF) wells need to be drilled, and data recorders and stage sensors installed to obtain background water level data prior to the beginning of pumping stresses. At the time mining operations begin, compute pre-mining average water levels for each Group 1 (LBF) well by averaging daily water levels for each well during the last 12 months of the pre-mining monitoring program. The pre-mining monitoring program should be a minimum of one year in duration, and preferably two years. In addition, for each Group 1 well, determine the **annual pre-mining water level fluctuation** observed during the pre-mining period by calculating the difference between the highest and lowest water level elevations in each well during the last twelve months of the pre-mining period.

Model, Monitor and Mitigate Program:

The following steps guide the annual processing of observed and model-projected data on water levels in specific wells and the model cells that represent those wells. Values determined in the steps below are used in the recalibration decision process presented in Figure 5 of this document. The reader should review the grouping of wells presented in Tables 3 and 4 prior to processing the data.

Group 1 (LBF) Wells:

1. At the end of each annual evaluation period, determine (A) the average monthly water level elevation in each Group 1 well for the last month in the evaluation period. After re-running the model with actual pumping rates over the evaluation period, determine (B) the model-projected water level elevation for the same month in each model cell representing a Group 1 well.

2. Subtract the average monthly water level elevation computed in step 1(A) above from the observed water levels in the same well at the time of the most recent model calibration[1] for each Group 1 well to compute the **observed drawdowns since the previous calibration**. Subtract the model-projected water level elevations determined in step 1(B) above from the model-projected water level elevations for those same cells at the time of the most recent calibration to compute the **modeled drawdowns since the previous calibration.**

3. Compute the observed gradient for each Group 1 well pair (e.g., LBF-1 & LBF-2) by subtracting the average monthly water level elevation computed in step 1 (A) above for the well closest to the Gila River from the corresponding value for the well farthest from the river to determine the difference in water level in the well pair. This value is then divided by the horizontal distance between the two wells in the pair to obtain the observed gradient. The change in observed gradient since the previous calibration is calculated by subtracting the current gradient value from the gradient value computed for this pair at the time of the most recent model calibration. The percentage change in the observed gradients is then computed by dividing the observed change in gradient since the previous calibration by the observed gradient at the previous calibration and multiplying the result by 100.

4. Compute the model-projected gradient for each model cell pair representing an LBF well pair by subtracting the model-projected water level elevation determined in step 1 (B) above for the cell in the model closest to the river from the corresponding value determined in step 1 (B) for the cell in the model farthest from the river. The difference in model-projected water levels in the two cells is then divided by the horizontal distance between the two cell centers in the pair to obtain the projected gradient. The change in model-projected gradient since the previous calibration is calculated by subtracting the current gradient value from the gradient value computed for this pair at the time of the most recent model calibration. The percentage change in the model-

[1] For the first evaluation period, use the mean annual water level for each well that was determined in the Pre-mining Monitoring Program.

projected gradients is then computed by dividing the model-projected change in gradient since the previous calibration by the model-projected gradient at the previous calibration and multiplying the result by 100.

5. For each Group 1 Well pair compute the **difference between the percentage changes of the observed and model-projected gradients** over the evaluation period by subtracting the modeled percentage change in gradient computed in step 4 from the observed percentage change in gradient computed in step 3.

Group 2 Wells:

6. For each Group 2 well, use the most recent water level measurement as the observed value. Subtract this value from the water level for that well at the time of the most recent model calibration[2] to obtain the observed drawdown for each well.

7. Use model-projected water levels at the time of the measurements used in step 6 for each cell representing a Group 2 well, and subtract these values from the model-projected water levels for the same cells at the time of the last model calibration to obtain model-projected drawdowns for each Group 2 cell[3].

8. Compute the absolute difference between the model-projected and observed drawdown for each cell representing a Group 2 well. Divide the result obtained for each well by the observed drawdown for that well, and multiply by 100 to compute a percentage difference.

9. Sum all the values computed in step 8, and divide by the number of Group 2 wells for which data was available to obtain the **mean value** of the percent difference between model-projected and observed drawdowns.

Group 4 Wells:

10. Follow the same procedures for Group 4 wells as in steps 6 and 7 above for the Group 2 wells. Compute the absolute difference between model-projected and observed drawdowns since the last model calibration for each Group 4 well. Sum the absolute difference for all Group 4 wells and divide by the number of wells in Group 4 for which data were available to obtain the **average absolute difference**.

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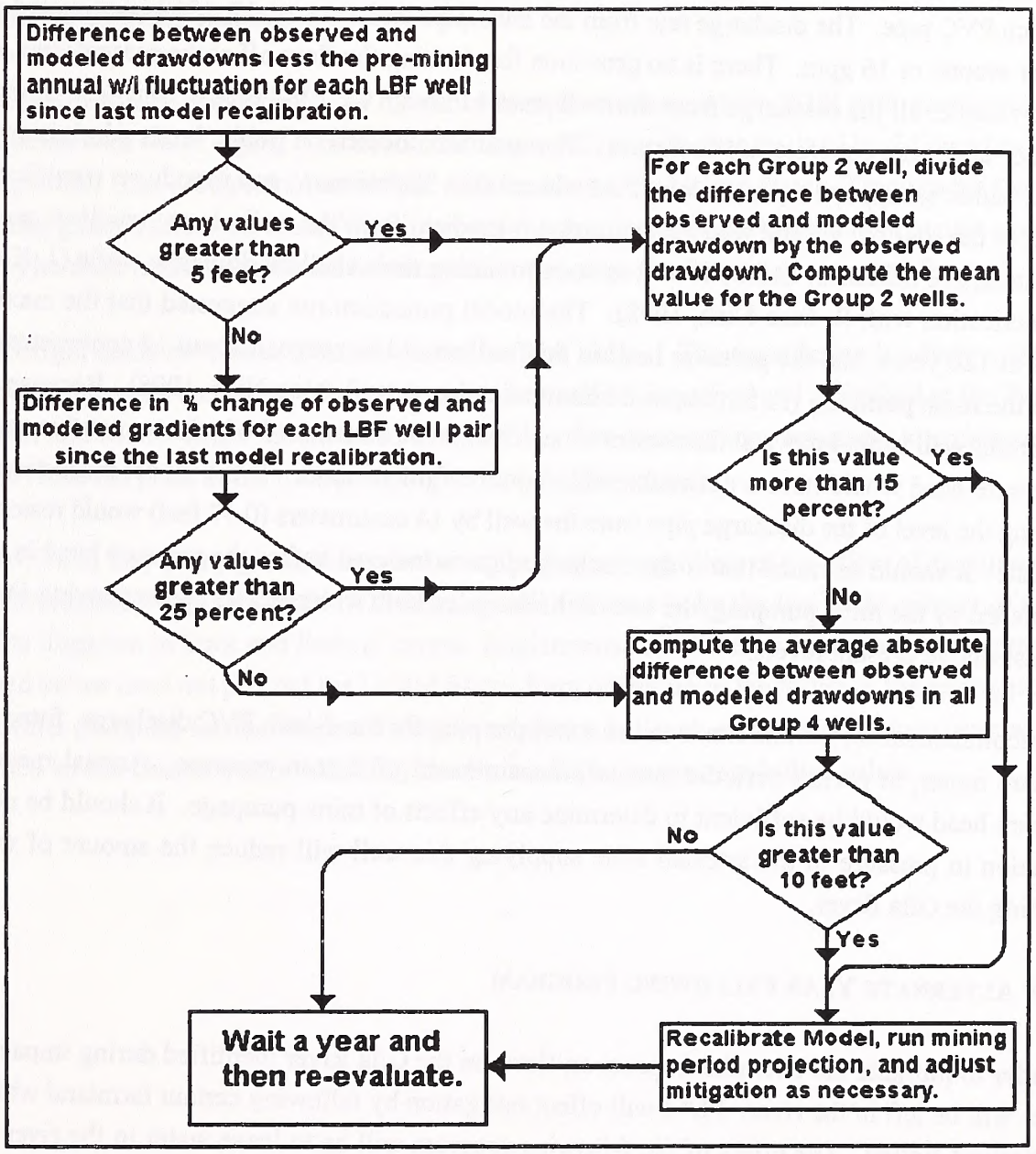
[2] For the first evaluation period, use the latest Pre-Mining water level for each well.

[3] For cell locations with wells open to more than one model layer, average water levels for all model layers the well is open to.



PHELPS DODGE SAFFORD, INC. Dos Pobres/San Juan Draft HMMP	Figure 6	Schematic Flowchart of the Groundwater Model, Monitor, and Mitigate Process

Ten\C:\Wyfiles\PhelpsDodge\SafordHMMP\MacNish figures

3.3.2 WATSON WASH FLOWING WELL MONITORING PROGRAM

The Watson Wash Flowing Well is not a natural hydrologic feature. It is a well drilled and left uncapped, which flows water high in total dissolved solids, on a continual basis. The well head is presently concealed by a rock and concrete tub (Photo-sheet 4) and the discharge from the well head is conducted into the tub by 2-inch PVC pipe. The discharge rate from the PVC pipe on February, 12, 1998 is estimated at about one liter per second or 16 gpm. There is no provision for shutting the flow off at the present time, and it is not known whether all the discharge from the well passes through the PVC pipe or whether some may escape within or under the concrete tub enclosure. The well/tub, located on public lands administered by BLM, attracts bather's, supports a population of introduced Gila Topminnow, and introduces significant quantities of salts to the shallow ground water systems down-gradient from the well. Local residents portray the site as an attractive nuisance, and believe it is contaminating their shallow domestic wells (J. Korolsky, oral communication with R. Mac Nish, 1998). The model projection run suggested that the maximum effect occurs at 126 years, and the pressure head in this well would be reduced about 14 centimeters (0.47 feet), due to the mine pumping (P. Sinton, oral communication with R. Mac Nish, 1998). Because the pressure head in this well is not known at the present time, it cannot be determined whether or not this small reduction in pressure head would have a noticeable effect on the flow of water. If the model projection is accurate, lowering the level of the discharge pipe from the well by 14 centimeters (0.47 feet) would restore the present flow rate. It should be noted that if the discharge pipe is lowered before the pressure head in the aquifer is diminished by the mine pumping, the rate of discharge of both water and its accompanying salt load would increase above present levels.

The recommendation for this site is to use a stopper plug for the 2-inch PVC discharge, fitted with a water pressure meter, to permit periodic (annual) measurement of shut-in pressure. Annual measurements of pressure head would be sufficient to determine any effects of mine pumpage. It should be noted that any reduction in pressure in the artesian zone supplying this well will reduce the amount of water and salt reaching the Gila River.

3.3.3 ALTERNATE YEAR FALLOWING PROGRAM

In order to mitigate the potential impacts on flows in the Gila River identified during impact assessment, water will be left in the river. PDSI will effect mitigation by fallowing certain farmland which it owns in the Safford Valley. The effect of the fallowing program will be to leave water in the river which would otherwise have been diverted for irrigation. The intent of the fallowing program is to leave a minimum of 75.4 acre-feet of water per year in the river that would have otherwise been consumed by crops. Although the full predicted impacts of pumping do not occur for over 400 years, the mitigation will be implemented within one year of Project startup.

Under the fallowing program certain farmlands will be fallowed in alternating years, such that a specific acreage of land will be fallowed every year. Lands that are fallowed in a particular year will not be permitted to be irrigated. Since the river is fully appropriated, it might be possible for others to use water resulting

from PDSI's fallowed land. To avoid this, the fallowing program will focus on foregoing the use of natural flow water rights during months in which water is flowing past diversion points in the river into San Carlos Reservoir, typically the months of January through April of each year. Natural flow water foregone by PDSI during these months will demonstrably be left in the river and not used by other water rights holders. In addition, fallowed lands will not use groundwater from wells which would otherwise have been pumped during the dry months in which natural flow is not available.

The fallowing program will be implemented by means of deed restrictions, which PDSI will record against identified PDSI lands with water rights. The deed restrictions will require that the land be fallowed every other year in perpetuity. The deed restriction will be enforceable by the United States (Through the Corps regulatory authority granted under the Clean Water Act and the conditions of any Section 404 permit issued for this project. The deed restrictions would be removed in the event the Project does not go forward.

PDSI owns water right lands in various locations in the Safford Valley. The specific lands which will be used in the fallowing program have not yet been identified but will be identified and described in the Final Habitat Mitigation and Monitoring Plan included in the FEIS. Deed restrictions requiring alternate year fallowing will be recorded prior to the time pumping for the project begins.

Under current law, PDSI may pump groundwater for use at the Project regardless of the effect of its pumping on groundwater levels under adjacent land. Whether this will continue to be the law is the subject of on-going water rights litigation in State and Federal courts. Implementation of the water resources mitigation programs outlined below does not prevent the United States from objecting in the future in the appropriate court to groundwater pumping for the Project if the United States believes such pumping interferes with water rights owned by the United States or held by the Unites States in trust for Indian tribes.

4. REFERENCES

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PHOTO SHEETS

Photo 1a. Existing burned riparian habitat north of the pasture on the Ft. Thomas site.

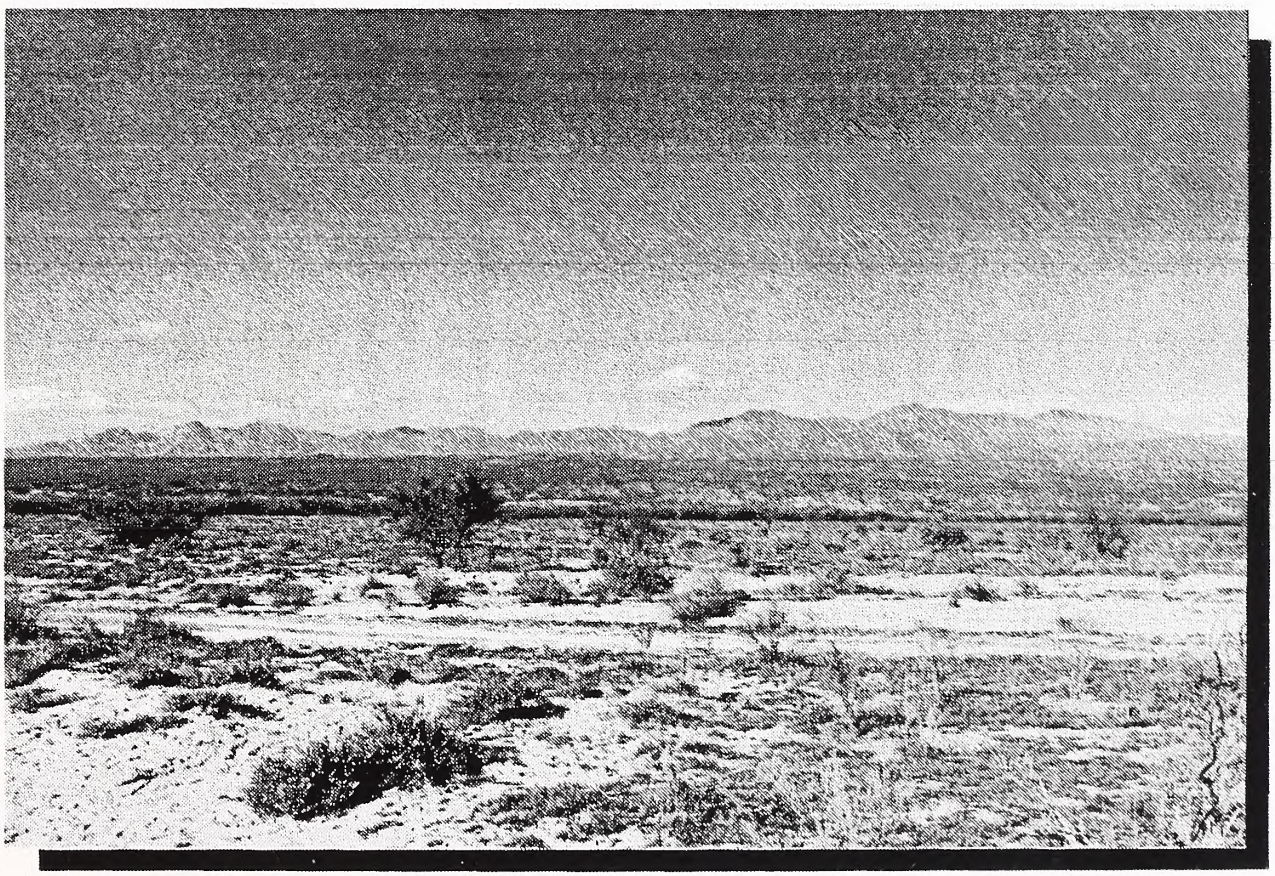

Photo 1b. Cleared pasture at the Ft. Thomas mitigation site.

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Photo Sheet 1

Ft. Thomas Mitigation Site

Photo 2a. Sudan-grass pasture and burned riparian vegetation within the ±40 acre habitat creation area.

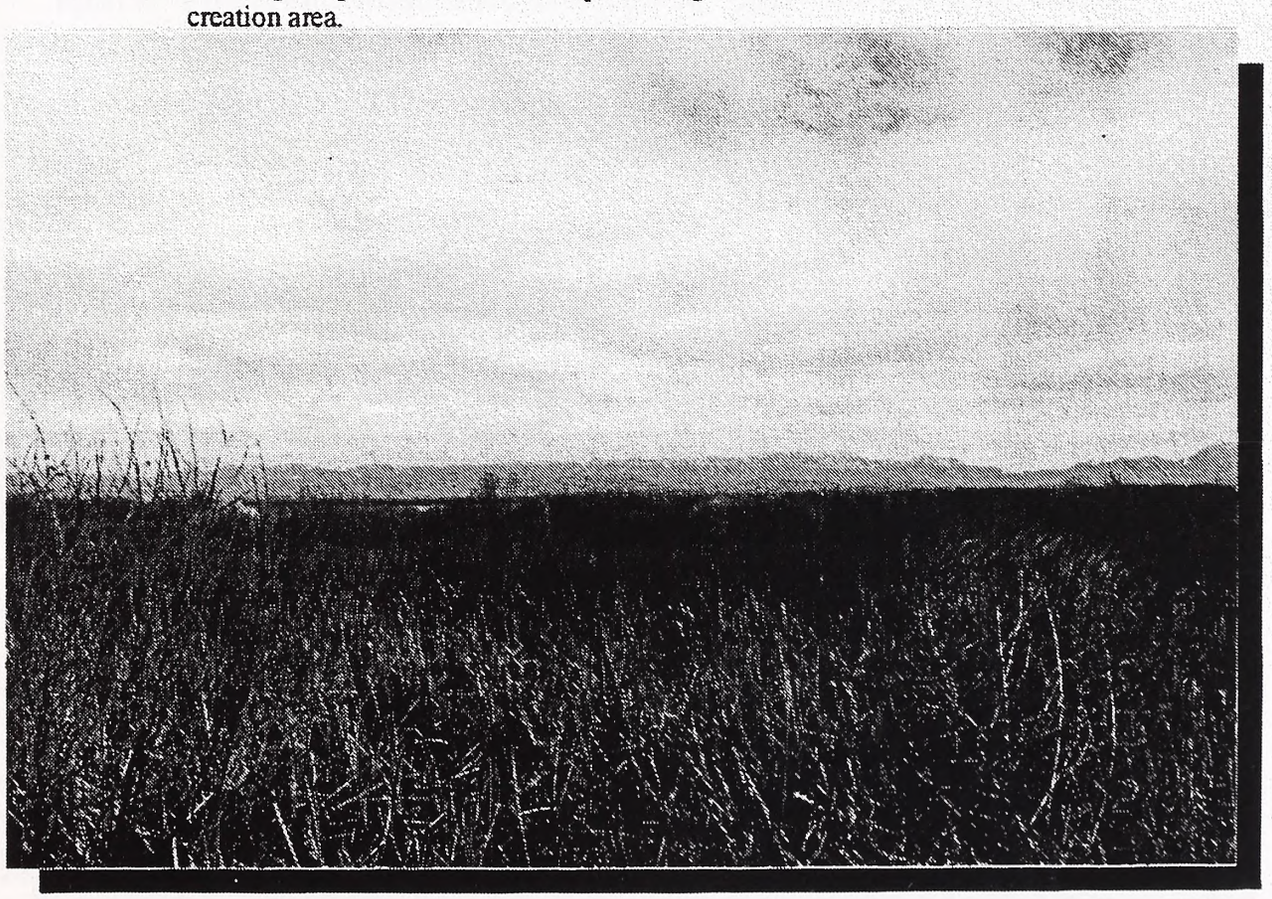

Photo 2b. Photo of habitat enhancement area. Vegetation in this area is variously dominated by tamarisk and willow with patches of cattail.

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Photo Sheet 2

Thatcher Mitigation Site

Photo 3a. Existing earthen berm at east end of property. Opportunities for habitat creation exist at the toe towards the river ±40ft. and on the landward side of the berm.

Photo 3b. Looking from the east end of the property south towards the river.

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Photo Sheet 3

Solomon Mitigation Site

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ACRONYMS AND ABBREVIATIONS

AAC	Arizona Administrative Code
ACEC	Area of Critical Environmental Concern
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
af/yr	acre-feet per year
AGFD	Arizona Game and Fish Department
ANFO	Ammonium nitrate and fuel oil
APP	Aquifer Protection Program
ARS	Arizona Revised Statutes
ASM	Arizona State Museum
ATI	Agreement to Initiate a Land Exchange
AUM	Animal Unit Month
AWQS	Arizona Water Quality Standards
BADCT	Best Available Demonstrated Control Technology
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
cfs	cubic feet per second
CO	carbon monoxide
COE	Corps of Engineers
CWA	Clean Water Act
DEIS	Draft Environmental Impact Statement
DOI	Department of Interior
EA	Environmental Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEIS	Final Environmental Impact Statement
FIRE	Finance, Insurance, and Real Estate
FLEFA	Federal Land Exchange Facilitation Act
FLPMA	Federal Land Policy and Management Act
gpd	gallons per day
gpm	gallons per minute
HDPE	High-density polyethylene
H_2SO_4	sulfuric acid
IBLA	Interior Board of Land Appeals
ID Team	Interdisciplinary Team
kV	kiloVolt
LOS	Level of Service
LTMA	Long-Term Management Area
LUST	Leaking Underground Storage Tanks
LWCF	Land and Water Conservation Fund
$\mu g/m^3$	micrograms per cubic meter
MPO	Mining Plan of Operations
MSHA	Mine Safety and Health Administration
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native Am. Graves Protection & Repatriation Act
NCA	National Conservation Area, including RNCAs
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	unspecified form of nitrogen oxide
NOA	Notice of Availability
NOD	Notice of Decision
NOI	Notice of Intent to Prepare an EIS
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resource Conservation Service
OSHA	Occupational Safety and Health Administration
PD	Phelps Dodge (parent corporation)
PDSI	Phelps Dodge Safford, Inc.
PILT	Payment in Lieu of Taxes
PLS	Pregnant Leach Solution
PM	Particulate Matter
PM_{10}	Particulate Matter of 10 microns or less in aerodynamic diameter
$PM_{2.5}$	Particulate Matter of 2.5 microns or less in aerodynamic diameter
PMLU	Post-mining land use
RCA	Resource Conservation Area
RCRA	Resource Conservation and Recovery Act
RMP	Resource Management Plan
RNCA	Riparian National Conservation Area (subset of NCA)
ROD	Record of Decision
ROM	Run-of-Mine
ROW	Right-of-way
SCS	Soil Conservation Sevice
SO_2	sulphur dioxide
SPCC	Spill Prevention Control and Countermeasure Plan
SX/EW	Solution Extraction/Electrowinning
TCP	Traditional Cultural Property
tpd	tons per day
USC	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
UST	Underground Storage Tanks
W&SR	Wild and Scenic Rivers
WQARF	Arizona Water Quality Assurance Revolving Fund (WQARF) site
WSCA	Wildlife Species of Concern in Arizona
VOC	Volatile Organic Compound
VRM	Visual Resource Management
zipACIDS	Arizona CERCLA Information and Data System sorted by postal zip code

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